



**Billing Code 4333-15**

**DEPARTMENT OF THE INTERIOR**

**Fish and Wildlife Service**

**50 CFR Part 17**

**[Docket No. FWS–R9–ES–2012–0013; 4500030115]**

**RIN 1018–BC79**

**Endangered and Threatened Wildlife and Plants; Listing the Hyacinth Macaw**

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Final rule.

**SUMMARY:** We, the U.S. Fish and Wildlife Service, determine threatened species status under the Endangered Species Act of 1973 (Act), as amended, for the hyacinth macaw (*Anodorhynchus hyacinthinus*), a species that occurs almost exclusively in Brazil and marginally in Bolivia and Paraguay. This rule adds this species to the List of Endangered and Threatened Wildlife. We are also establishing a rule pursuant to section 4(d) of the Act to further provide for the conservation of the hyacinth macaw.

**DATES:** This rule is effective [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

**ADDRESSES:** Comments and materials received, as well as supporting documentation used in the preparation of this rule, are available for public inspection at <http://www.regulations.gov> under Docket No. FWS–R9–ES–2012–0013.

**FOR FURTHER INFORMATION CONTACT:** Don Morgan, Chief, Division of Delisting and Foreign Species, Ecological Services Program, U.S. Fish and Wildlife Service, 5275

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## **SUPPLEMENTARY INFORMATION:**

### **Executive Summary**

*Why we need to publish a rule.* Under the Endangered Species Act (Act), a species may warrant protection through listing if it is found to be an endangered or threatened species. Listing a species as an endangered or threatened species can only be completed by issuing a rule. On July 6, 2012, the U.S. Fish and Wildlife Service (Service) published in the *Federal Register* (FR) a 12-month finding and proposed rule to list the hyacinth macaw (*Anodorhynchus hyacinthinus*) as an endangered species under the Act (77 FR 39965). On November 28, 2016, the Service published a revised proposed rule to list the hyacinth macaw as a threatened species (81 FR 85488), which included a proposed rule under section 4(d) of the Act that defined the prohibitions we are extending to the hyacinth macaw and the exceptions to those prohibitions, as well as provisions that are necessary and advisable for the species' conservation. This rule finalizes the listing of the hyacinth macaw as a threatened species under the Act, and establishes a 4(d) rule to further provide for the species' conservation.

*The basis for our action.* Under section 4(a)(1) of the Act, we determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. The primary causes attributed to the decline of the hyacinth macaw

include habitat loss and degradation (Factor A), hunting (Factor B), predation (Factor C), competition and low reproduction rate (Factor E), and climate change (Factor E).

Section 4(d) of the Act authorizes the Secretary of the Interior (Secretary) to extend to threatened species the prohibitions provided for endangered species under section 9 of the Act. Our implementing regulations for threatened wildlife, found at title 50 of the Code of Federal Regulations (CFR) at § 17.31 (50 CFR 17.31), incorporate the section 9 prohibitions for endangered wildlife, except when a species-specific rule under section 4(d) of the Act is promulgated. For threatened species, section 4(d) of the Act gives the Service discretion to specify the prohibitions and any exceptions to those prohibitions that are appropriate for the species, as well as include provisions that are necessary and advisable to provide for the conservation of the species. A rule issued under section 4(d) of the Act allows us to include provisions that are tailored to the specific conservation needs of that threatened species and which may be more or less restrictive than the general provisions at 50 CFR 17.31.

*Peer review and public comment.* We sought comments from independent specialists to ensure that our analysis is based on scientifically sound data, assumptions, and analyses. We invited peer reviewers and the public to comment on our listing proposals. All substantive information from peer review and public comments was fully considered and incorporated into this final rule, where appropriate.

### **Previous Federal Actions**

Please refer to the proposed listing rule, published in the *Federal Register* on July 6, 2012 (77 FR 39965), for previous Federal actions for this species prior to that date. The publication of the proposed listing rule opened a 60-day public comment period, which closed on September 4, 2012. Based on new information, on November 28, 2016, we published a revised proposed rule

(81 FR 85488) to list the hyacinth macaw as a threatened species, which included a proposed rule under section 4(d) of the Act (16 U.S.C. 1531 *et seq.*) that defines the conservation measures that apply to the hyacinth macaw (50 CFR 17.41(c)). That revised proposed rule also opened a 60-day public comment period, which closed on January 27, 2017.

### **Summary of Changes from the Revised Proposed Rule**

We included additional information regarding action plans in Brazil that aim to reduce deforestation.

Brazil has implemented actions plans that aim to reduce deforestation rates in the Amazon and Cerrado, referred to as the Plan of Action for Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) and the Action Plan for the Prevention and Control of Deforestation and Burning in the Cerrado (PPCerrado), respectively. In the proposed rule we stated that we did not have any details regarding the success or progress of these plans. However, in this final rule we included the most recent information available and results achieved by these plans (see Factor D discussion, below).

### **Summary of Comments and Recommendations**

We reviewed all comments we received from peer reviewers and the public for substantive issues and new information. All substantive information from peer review and public comments has been fully considered and is incorporated into this final rule, where appropriate.

We received 104 public comments combined on the proposed and revised proposed rules to list the hyacinth macaw under the Act during their respective comment periods. Many commenters supported listing the hyacinth macaw as an endangered or threatened species under the Act. However, many commenters also recommended that we issue a rule under section 4(d) of the Act that would allow interstate commerce of hyacinth macaws to occur without needing a

permit. The following discussion summarizes issues and substantive information from public comments and provides our responses.

*Comment (1):* Many commenters opined that the Act was meant to protect species native to the United States, and the hyacinth macaw should not be listed since it is a foreign species.

*Our Response:* The Act does not differentiate between domestic and foreign species as it applies to our responsibilities to determine whether species are endangered or threatened, and sections 4(b)(1)(A) and 4(b)(1)(B)(i) expressly require the Service to consider efforts by a foreign nation prior to making a listing determination. The broad definitions of “species,” “fish or wildlife,” and “plants” in section 3 of the Act do not differentiate between species native to the United States, species native to both the United States and one or more other countries, and species not native to the United States. Further, the findings and purposes at sections 2(a)(4), 2(a)(5), and 2(b) of the Act also speak to the application of the Act to foreign species and numerous provisions of the Act and the implementing regulations refer to foreign jurisdictions (e.g., sections 8 and 8A, 50 CFR 424.11(e)).

*Comment (2):* Some commenters believed that there is no demonstrable benefit to listing the hyacinth macaw under the Act because it is already protected by CITES and the Wild Bird Conservation Act (WBCA; 16 U.S.C. 4901–4916).

*Our Response:* The decision to list a species under the Act is based on whether the species meets the definition of an endangered or threatened species as defined under section 3 of the Act and is made solely on the basis of the best scientific and commercial data available. Conservation measures provided to species listed as endangered or threatened under the Act include recognition, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and may encourage and result

in conservation actions by foreign governments, Federal and State governments, private agencies and interest groups, and individuals. The purpose of the WBCA is to ensure that exotic bird species are not harmed by international trade and encourages wild bird conservation programs in countries of origin. The purpose of CITES is to ensure that international trade in plants and animals does not threaten their survival in the wild. Protection provided by other laws, such as CITES and WBCA, is taken into consideration when determining the status of the species. However, simply being protected by these other laws does not preclude the need to list if the species still meets the definition of an endangered or threatened species. Listing under the Act can help ensure that the United States and its citizens do not contribute to the further decline of the species. That said, we considered the conservation role that CITES and WBCA provide when developing the 4(d) rule for the species. The 4(d) rule that we are putting in place streamlines the permitting process by deferring to existing laws that are protective of hyacinth macaws in the course of import and export and not requiring permits under the Act for certain types of activities. Additionally, we are not prohibiting interstate commerce of hyacinth macaw within the United States (see **4(d) Rule**, below).

*Comment (3):* Several commenters stated that the information used in the proposed rule was outdated; one also expressed concern that the information was from English-only sources.

*Our Response:* The Service is required by the Act to make determinations solely on the basis of the best scientific and commercial data available. We based the proposed rule on all the information we received following the initiation of the status review for the hyacinth macaw, as well as all of the information we found during our own research. The information we use is not always current, as it depends on research being conducted in the field and the availability of information. At that time, the information we compiled was considered the best available

information. After we published the proposed rule in 2012, additional information became available or was submitted by the public, including more recent information and studies from a species expert and conservation organizations within the hyacinth macaw's range countries. Literature that was not in English was professionally translated and then reviewed, to the best of our ability. The information we received has been incorporated into this final rule and helped serve as the basis for our determination that the hyacinth macaw is threatened, not endangered.

*Comment (4):* Two commenters stated that significant additional wild populations have been recently discovered and were not included in the data cited for the proposed listings.

*Our Response:* The commenters did not provide any information or citations to support their claims. The information that we have indicates that hyacinth macaws may be expanding into new areas or areas previously abandoned; however, we found no support for significant additional populations having been established. The overall population estimate for the hyacinth macaw remains 6,500 individuals.

*Comment (5):* Many commenters raised concerns about the listing of the hyacinth macaw due to economic impacts on small businesses because of the restriction on commercial trade within the United States.

*Our Response:* Determinations on whether a species should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants are based on whether the species meets the definition of "endangered species" or of "threatened species" in section 3 of the Act. The Act directs the Service to make these determinations solely on the basis of the best scientific and commercial data available. Furthermore, the Act directs the Service to consider economic impacts only when designating critical habitat. Therefore, we may not consider economic impacts when determining the status of a species. We understand that the regulations imposed by

the listing of the hyacinth macaw will have an effect on those involved in the pet bird industry, especially bird breeders. The 4(d) rule that we are putting in place streamlines the permitting process by deferring to existing laws that are protective of hyacinth macaws in the course of import and export and not requiring permits under the Act for certain types of activities. Additionally, we are not prohibiting interstate commerce of hyacinth macaw within the United States (see **4(d) Rule**, below).

*Comment (6):* Some commenters requested that captive birds in the United States be considered a separate and self-sustaining population from the wild population because the wild populations are in need of immediate help and should be managed and listed independently under the Act.

*Our Response:* We have determined that the Act does not allow for captive wildlife to be assigned separate legal status from their wild counterparts on the basis of their captive state, including through designation as a separate distinct population segment (DPS) (80 FR 34500; June 16, 2015).

*Comment (7):* One commenter stated that the proposed rule does not address the many positive steps that have been taken to conserve the hyacinth macaw in the wild. The commenter referenced the work of the Hyacinth Macaw Project specifically.

*Our Response:* We included a detailed description of the work being done by the Hyacinth Macaw Project under *Conservation Measures* in the November 28, 2016, revised proposed rule (81 FR 85488, November 28, 2016see pp. 85499–85501) and “Conservation Actions” in the July 6, 2012, proposed rule (77 FR 39965, see pp. 39971–39972). Our final rule considers and incorporates additional information we subsequently received from the President



of the Hyacinth Macaw Institute and Coordinator for the Hyacinth Macaw Project, Neiva Guedes.

*Comment (8):* Two commenters pointed to a recent increase in deforestation within the hyacinth macaw's range as a reason why the species should be listed as endangered rather than threatened.

*Our Response:* The deforestation rate is generally decreasing from historical levels (see Factor A discussion, below), although we recognize that the rates of deforestation may fluctuate annually, with some years having a higher rate than other years. If the deforestation rates are maintained or further reduced, the loss of all native habitat from these areas, including the species of trees needed by the hyacinth macaw for food and nesting, and the hyacinth macaw's risk of extinction, is not as imminent as predicted. Additionally, Brazil has implemented plans to reduce deforestation in the Amazon (PPCDAm) and Cerrado (PPCerrado) and has obtained significant reduction of the deforestation rate after 12 years of the PPCDAm and 6 years of PPCerrado (see Factor D discussion, below). Therefore, we do not find that the hyacinth macaw is currently in danger of extinction.

*Comment (9):* One commenter stated that deforestation stabilization does not equate with regeneration and does not account for negative impacts of historical habitat disturbance, which effects manduvi in the Pantanal, upon which the hyacinth macaw relies almost exclusively for nesting.

*Our Response:* Although the recruitment of the manduvi tree has been severely reduced and is expected to become increasingly rare in the future, active management has contributed to the increase in the hyacinth macaw population in the Pantanal, and farmers have begun to protect hyacinth macaws on their property. Additionally, hyacinth macaws have been reported in various

trees species and even on cliffs on the border of the Pantanal (see *Essential Needs of the Species*, above), although the majority of their nests are in Brazil nut (*Bertholettia excels*) (in Pará) and manduvi (in the Pantanal). Further, hyacinth macaws in the Gerais region now use rock crevices for nesting. While we do not know if the hyacinth macaws in this region will respond in the same way to the loss of nesting trees as those in the Gerais region, it is possible that if these primary nesting trees become scarcer, hyacinth macaws may adapt to using cavities of other trees (van der Meer 2013, p. 3) or perhaps even cliff faces.

*Comment (10):* One commenter stated that we provide conflicting data on annual deforestation rates in the Gerais region because we stated that annual deforestation rates were more than 14,200 km<sup>2</sup> (5,483 mi<sup>2</sup>) each year from 2002 to 2008, an estimated 12,949 km<sup>2</sup> (4,999 mi<sup>2</sup>) per year from 2000 to 2005, and 11,812 km<sup>2</sup> (4,560 mi<sup>2</sup>) per year from 2005 to 2010.

*Our Response:* We cited the best available data from research that used time frames that overlap or vary; therefore, it is difficult to make comparisons between studies and across years to provide a linear estimate of the annual deforestation rates within the species' range. Estimates of the deforestation rate from 2002 to 2008 of 14,200 km<sup>2</sup> (5,483 mi<sup>2</sup>) each year are based on data from the PROBIO program (Projeto de Conservação e Utilização Sustentável da Diversidade Biológica) using imagery from 2002 (Beuchle *et al.* 2015, p. 117). The Project to Monitor Deforestation of Brazilian Biomes by Satellite (PMDBBS) used this baseline data to estimate deforestation rates from 2002 through 2008 in the Cerrado (see Table 2, below), and to map cleared areas from 2008 to 2009, 2009 to 2010, and 2010 to 2011; these data are also cited by Brazilian Ministry of the Environment (Ministério do Meio Ambiente) (MMA) (2015, p. 9) and World Wildlife Fund—United Kingdom (WWF–UK) (2011b, p. 2). The PMDBBS is one of the official national biome scale estimates for the Brazilian biomes. Estimates of the deforestation

rate we cited from 2000 to 2005 of 12,949 km<sup>2</sup> (4,999 mi<sup>2</sup>) per year and from 2005 to 2010 of 11,812 km<sup>2</sup> (4,560 mi<sup>2</sup>) per year are from Beuchle *et al.* (2015, pp. 124–125), who were comparing their results to PMDBBS (see Factor A discussion, below).

*Comment (11):* Some commenters, while not opposed to the listing of the species, requested a rule under section 4(d) of the Act, which would allow ownership and interstate trade of the species to occur without obtaining a permit under the Act.

*Our Response:* Ownership of a listed species is not prohibited by the Act and, therefore, does not require a permit. Section 4(d) of the Act allows the Service to apply the prohibitions of section 9 or to provide measures that are necessary and advisable to provide for the conservation of threatened species. Therefore, whenever we list a species as a threatened species, we may issue regulations as we deem necessary and advisable to conserve the species under a 4(d) rule. We determined that listing the hyacinth macaw as threatened under the Act is appropriate, and as part of our determination, this final listing includes a 4(d) rule for the species articulating the measures that we deemed is necessary and advisable for the conservation of the species. See **4(d) Rule**, below, for more discussion.

*Comment (12):* Two commenters stated that the proposed 4(d) rule is not adequate because it does not stem demand for illegally obtained hyacinth macaws and makes wild-sourced supply of hyacinth macaws more accessible to breeders.

*Our Response:* The 4(d) rule generally adopts the existing conservation regulatory requirements of CITES and the WBCA as the appropriate regulatory provisions for the import and export of certain hyacinth macaws. CITES is an international agreement between governments and ensures that the international trade of CITES-listed plants and animals does not threaten the survival of the species in the wild. Trade must be authorized through a system of

permits and certificates that are provided by the designated CITES Scientific and Management Authorities of each CITES Party. The hyacinth macaw is listed in Appendix I of CITES. For species included in CITES Appendix I, international trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The United States implements CITES through the Act and our implementing regulations at 50 CFR part 23. It is unlawful for any person subject to the jurisdiction of the United States to engage in any trade in any specimens contrary to the provisions of CITES, or to possess any specimens traded contrary to the provisions of CITES, the Act, or part 23. Protections for CITES-listed species are provided independently of whether a species is an endangered species or a threatened species under the Act.

Based on trade data obtained from the CITES Trade Database (accessed on January 12, 2018), from the time the hyacinth macaw was uplisted to CITES Appendix I in October 1987 through 2015, less than 3 percent of the live hyacinth macaws reported in trade were wild-sourced (see Factor B discussion and Table 4, below).

Two other laws in the United States apart from the Act provide protection from the illegal import of wild-caught birds into the United States: the WBCA and the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378). The WBCA ensures that exotic bird species are not harmed by international trade and encourages wild bird conservation programs in countries of origin. Under the WBCA and our implementing regulations (50 CFR 15.11), it is unlawful to import into the United States any exotic bird species listed under CITES except under certain circumstances. The Service may issue permits to allow import of listed birds for scientific research, zoological breeding or display, cooperative breeding, or personal pet purposes when the applicant meets certain criteria (50 CFR 15.22–15.25). Under the Lacey Act, in part, it is unlawful: (1) To

import, export, transport, sell, receive, acquire, or purchase any fish, or wildlife taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law, or (2) to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any State or in violation of any foreign law. For example, because the take of wild-caught hyacinth macaws would be in violation of Brazil's Environmental Crimes Law, the subsequent import of hyacinth macaws would violate the Lacey Act. Similarly, under the Lacey Act it is unlawful to import, export, transport, sell, receive, acquire, or purchase specimens of this species traded contrary to CITES.

Based in large part on the protection from illegal and legal trade afforded to the hyacinth macaw by CITES, the WBCA, and the Lacey Act, the best available data indicate that legal and illegal trade of hyacinth macaws is not currently occurring at levels that are affecting the population of the species in the wild or would negatively affect any efforts aimed at the recovery of wild populations of the species. Although illegal trapping for the pet trade occurred at high levels during the 1980s, it has decreased significantly and we found no information suggesting that illegal trapping and trade of wild hyacinth macaws are current threats to the species. Therefore, we find that our 4(d) rule contains all the prohibitions and authorizations necessary and advisable for the conservation of the hyacinth macaw.

*Comment (13):* One commenter stated that interstate and international transport of hyacinth macaws seems to be a generally accepted practice of the exotic pet trade, and one that is expressly endorsed by the 4(d) rule, yet it is extremely dangerous and often detrimental to the animal's health and well-being.

*Our Response:* International transport is guided by part 50 CFR part 14, subpart J—Standards for the Humane and Healthful Transport of Wild Mammals and Birds to the United States. As mentioned earlier, importers/exporters must meet the requirement of this and other requirements in order to import their birds into the United States. These regulations are enforced by the Service. Interstate transport is guided by the Animal Welfare Act (AWA) (7 U.S.C. 2131 *et seq.*), which is the Federal law in the United States that regulates the treatment of animals in research, exhibition, transport, and by dealers (United States Department of Agriculture 2017, unpaginated). While other laws, policies, and guidelines may include additional species coverage or specifications for animal care and use, all refer to the AWA as the minimum acceptable standard. The AWA is enforced by the U.S. Department of Agriculture, Animal and Plant Health Inspection Service. Therefore, we determine that these laws and regulations adequately promote the humane treatment and transport of hyacinth macaws.

*Comment (14):* One commenter recommended there be an exception for legitimate parrot owners and opined that the United States should not confiscate private property (i.e., legitimately purchased pets) because of a problem occurring in Brazil, especially when there are already laws to protect wild parrots.

*Our Response:* There is no prohibition for ownership of lawfully acquired hyacinth macaws. With regards to import/export, we proposed exceptions for personal pet parrot owners in the 4(d) rule to allow a person to import or export either: (1) A specimen that was held in captivity prior to the date this species is listed under the Act; or (2) a captive-bred specimen, without a permit issued under the Act, provided the export is authorized under CITES and the import is authorized under CITES and the WBCA. A person may deliver, receive, carry, transport, or ship a hyacinth macaw in interstate commerce in the course of a commercial

activity, or sell or offer to sell in interstate commerce a hyacinth macaw without a permit under the Act. However, the import and export of birds into and from the United States, taken from the wild after the date this species is listed under the Act; conducting an activity that could take or incidentally take hyacinth macaws; and foreign commerce will need to meet the requirements of 50 CFR 17.31 and 17.32, including obtaining a permit under the Act. See **4(d) Rule**, below, for more discussion.

*Comment (15):* One commenter believed that we should have listed the species as endangered because they believed that it is in danger of extinction in a significant portion of its range.

*Our Response:* Under the Act and our implementing regulations, a species may warrant listing if it is an endangered or threatened species. The Act defines “endangered species” as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and “threatened species” as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). Because we have determined that the hyacinth macaw is threatened throughout all of its range, under the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species” and “Threatened Species” (79 FR 37578; July 1, 2014) (SPR Policy), if a species warrants listing throughout all of its range, no portion of the species’ range can be a “significant” portion of its range.

While it is the Service’s position under the SPR Policy that no further analysis of “significant portion of its range” in this circumstance is consistent with the language of the Act, we recognize that the SPR Policy is currently under judicial review, so we also took the

additional step of considering whether there could be any significant portions of the species' range where the species is in danger of extinction. We evaluated whether there is substantial information indicating that there are any portions of the hyacinth macaw's range: (1) That may be "significant," and (2) where the species may be in danger of extinction. In practice, a key part of identifying portions appropriate for further analysis is whether the threats are geographically concentrated. The hyacinth macaw's primary driver of its status is habitat destruction. This threat is affecting the species throughout its entire range and is of similar magnitude throughout its range; therefore, there is not a meaningful geographical concentration of threats to the hyacinth macaw. As a result, even if we were to undertake a detailed SPR analysis, there would not be any portions of the species' range where the threats are harming the species to a greater degree such that the species is in danger of extinction in that portion.

*Comment (16):* One commenter stated that the Service was obligated to issue a final regulation based on the proposal to list the hyacinth macaw as endangered in 2012, or issue a notice of withdrawal. They asserted the Service should have to go through the same requirements and procedures as for a downlisting by making a full scientific finding of why listing the hyacinth macaw as endangered is no longer warranted before it can repropose to list the species as threatened.

*Our Response:* We are obligated to make listing determinations under the Act based on the best available scientific and commercial information. In our 2012 proposed rule (77 FR 39965; July 6, 2012), we found that the hyacinth macaw was in danger of extinction (an endangered species) based on information estimating the original vegetation of the Amazon, Cerrado, and Pantanal, including the hyacinth macaw's habitat, would be lost between the years 2030 and 2050 due to deforestation, combined with the species' naturally low reproductive rate,



highly specialized nature, hunting, competition, and effects of climate change. However, subsequent to publishing that proposal, we received new information from the public and peer review. As a result of this information, we reevaluated impacts to the species, made technical corrections, and assessed additional information regarding conservation efforts. Subsequently, we revised our determination in consideration of the new information and public comments we received to conclude that the hyacinth macaw's risk of extinction is not as imminent as previously predicted, and we published a revised proposed rule that opened a new comment period to allow the public the opportunity to submit additional comments in light of this new information (81 FR 85488; November 28, 2016).

*Comment (17):* One commenter stated that, while the proposed 4(d) rule is an amendment of an existing 4(d) rule for several other species of parrots at 50 CFR 17.41(c), it leaves out two provisions of that existing rule: (1) The exception for import and export of captive-bred specimens, and (2) interstate commerce. They assert that because the Service includes these provisions in the preamble of the proposed 4(d) rule but does not include the actual text in the draft rule, the Service did not provide sufficient notice and opportunity for public comment.

*Our Response:* In the revised proposed rule, under **Proposed Regulation Promulgation** (81 FR 85488, November 28, 2016, see pp. 81 FR 85506–85507), we proposed to amend 50 CFR 17.41 by revising paragraph (c) introductory text, paragraphs (c)(1), (c)(2) introductory text, (c)(2)(ii) introductory text, and (c)(2)(ii)(E). The amendatory instruction and regulatory text were formatted in accordance with Office of the Federal Register standards and only include those provisions of the existing text that are being revised. The proposed regulatory text for 50 CFR 17.41(c), together with the text we were not proposing to amend in that paragraph of the CFR, encompasses the whole of the proposed 4(d) rule for the hyacinth macaw. As the

commenter notes, we explain the proposed 4(d) rule for the hyacinth macaw in the preamble of the revised proposed rule (81 FR 85488, November 28, 2016, see pp. 85505–85506). We accepted public comments on the revised proposed rule to list the hyacinth macaw as a threatened species, including the proposed 4(d) rule (81 FR 85488; November 28, 2016), for 60 days, ending January 27, 2017. We have complied with the notice-and-comment requirements of the Administrative Procedure Act (5 U.S.C. chapter 5) and the Act.

*Comment (18):* One commenter stated that neither CITES nor the WBCA provide for public notice and comment, which is required for permits for endangered species under the Act. They indicated the public would receive no notice about import/export or interstate movement of these parrots, which makes it difficult to track and protect these species from the pet trade.

*Our Response:* It is true that neither CITES nor the WBCA provide for public notice and comment for interstate movement of species. It is also true that there is required notice and comment for permits for endangered species under the Act. However, there is no notice-and-comment requirement for permits for threatened species. We found the hyacinth macaw to be a threatened species; therefore, the notice-and-comment provision for permits under the Act does not apply in this case. Additionally, we found it was not necessary or advisable for the conservation of the hyacinth macaw to extend the permit requirements to certain import/export and interstate transport because we did not find the pet trade to be a threat to the species. Further, interstate commerce within the United States was not found to threaten the hyacinth macaw, and the best available data indicate that legal and illegal trade of hyacinth macaws is not currently occurring at levels that are affecting the population of the species in the wild or would negatively affect any efforts aimed at the recovery of wild populations of the species.

*Comment (19):* One commenter stated that the Service provides no logical basis for the proposed 4(d) rule's assumption that "generally accepted animal husbandry practices" or breeding procedures do not result in harm and harassment as covered under the Act's prohibition on take.

*Our Response:* While the Act does not define "harm" or "harassment," the Service's regulations at 50 CFR 17.3 provide definitions for those terms. "Harm" is defined as an act which actually kills or injures wildlife and "harassment," when applied to captive wildlife, does not include generally accepted animal husbandry practices or breeding procedures as defined by the Service's regulations at 50 CFR 17.3. Consequently, such actions would not be prohibited or require a permit under the Act.

*Comment (20):* One commenter stated that wildlife-trade management authorities have shown that fraudulent permitting has been a frequent occurrence in many illicitly traded species across the globe (United Nations Office on Drugs and Crime 2016) and this impacts the hyacinth macaw.

*Our Response:* Although we recognize that fraudulent permitting may occur as part of the global wildlife trade, we have no information indicating that fraudulent permitting practices are impacting the hyacinth macaw. Furthermore, the commenter did not provide any information regarding fraudulent permitting specific to hyacinth macaws.

*Comment (21):* One commenter suggested an alternative 4(d) rule for the hyacinth macaw, which they say would better further the conservation of the species. The commenter suggested that any trade in captive-bred specimens must be limited to specimens legitimately designated as source code D instead of codes C, D, or F under CITES, and that commercial

interstate commerce should not be exempted. (*Note:* Source codes indicate the source of the specimen used on CITES permits and certificates. See **4(d) Rule**, below, for more discussion.)

*Our Response:* We considered the commenter’s alternative approach to the 4(d) rule, and ultimately we determined that the import and export requirements of 50 CFR 17.41(c) provide the necessary and advisable conservation measures needed for this species. Interstate commerce within the United States was not found to threaten the hyacinth macaw, and the best available data indicate that legal and illegal trade of hyacinth macaws is not currently occurring at levels that are affecting the population of the species in the wild or would negatively affect any efforts aimed at the recovery of wild populations of the species.

## **Background**

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in part 424 of title 50 of the Code of Federal Regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. The Act defines “endangered species” as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and “threatened species” as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)).

We summarize below the information on which we based our final determination and evaluation of the five factors provided in section 4(a)(1) of the Act. We are also including hyacinth macaws under a rule authorized under section 4(d) of the Act. This 4(d) rule contains the prohibitions and authorizations necessary and advisable for the conservation of the hyacinth macaw.

## **Species Information**

### *Taxonomy and Species Description*

The hyacinth macaw is one of three species of the *Anodorhynchus* genus and the largest bird of the parrot family, Family Psittacidae, (Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 405). It measures approximately 1 meter (m) (3.3 feet (ft)) in length. Average female and male wing lengths measure approximately 400 to 408 millimeters (mm) (1.3 ft), respectively. Average tail lengths for females and males are approximately 492 mm (1.6 ft) and 509 mm (1.7 ft), respectively (Forshaw 1989, p. 388). Hyacinth macaws are characterized by a predominately cobalt-blue plumage, black underside of wing and tail, and unlike other macaws, have feathered faces and lores (areas of a bird's face from the base of the bill to the front of the eyes). In addition, they have bare yellow eye rings, bare yellow patches surrounding the base of their lower mandibles, large and hooked gray-black bills, and dark-brown irises. Their legs, which are dark gray in most birds but lighter gray to white in older adults, are short and sturdy to allow the bird to hang sideways or upside down while foraging. Immature birds are similar to adults, but with shorter tails and paler yellow bare facial skin (Juniper and Parr 1998, pp. 416–417; Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 405; Forshaw 1989, p. 388).

The hyacinth macaw experiences late maturity, not reaching first reproduction until 8 or 9 years old (Guedes 2009, p. 117). Hyacinth macaws are monogamous and faithful to nesting sites; a couple may reproduce for more than a decade in the same nest. They nest from July to January in tree cavities and, in some parts of its range, cliff cavities (Tortato and Bonanomi 2012, p. 22; Guedes 2009, pp. 4, 5, 12; Pizo *et al.* 2008, p. 792; Pinho and Nogueira 2003, p. 35; Abramson *et al.* 1995, p. 2). The hyacinth macaw lays two smooth, white eggs approximately 48 mm (1.9 inches (in)) long and 36 mm (1.4 in) wide. Eggs are usually found in the nest from August until December (Guedes 2009, p. 4; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 406).

The female alone incubates the eggs for approximately 28 to 30 days. The male remains near the nest to protect it from invaders, but may leave 4 to 6 times a day to forage and collect food for the female (Schneider *et al.* 2006, pp. 72, 79; Guedes and Harper 1995, p. 406). Chicks are mostly naked, with sparse white down feathers at hatching. Young are fed regurgitated, chopped palm nuts (Munn *et al.* 1989, p. 405). Most chicks fledge at 105 to 110 days old; however, separation from the parents is a slow process. Fledglings will continue to be fed by the parents for 6 months, when they begin to break hard palm nuts themselves, and may remain with the adults for 16 months, after which they will join groups of other young birds (Schneider *et al.* 2006, pp. 71–72; Guedes and Harper 1995, pp. 407–411).

Hyacinth macaws naturally have a low reproductive rate, a characteristic common to all parrots, due, in part, to asynchronous hatching. Although hyacinth macaws lay two eggs, usually only one chick survives (Guedes 2009, p. 31; Faria *et al.* 2008, p. 766; Kuniy *et al.* 2006, p. 381; Guedes, 2004b, p. 6; Munn *et al.* 1989, p. 409). Not all hyacinth nests fledge young, and due to the long period of chick dependence, hyacinth macaws breed only every 2 years (Faria *et al.* 2008, p. 766; Schneider *et al.* 2006, pp. 71–72; Guedes 2004b, p. 7; Pinho and Nogueira 2003, p. 30; Guedes and Harper 1995, pp. 407–411; Munn *et al.* 1989, p. 409). In a study of the Pantanal, which contains the largest population of hyacinth macaws, it was suggested that only 15–30 percent of adults attempt to breed; it may be that the same or an even smaller percentage in Pará and Gerais attempt to breed (Munn *et al.* 1989, p. 409).

### *Range and Population*

At one time, hyacinth macaws were widely distributed, occupying large areas of Central Brazil into the Bolivian and Paraguayan Pantanal (Guedes 2009, pp. xiii, 11; Pinho and Nogueira 2003, p. 30; Whittingham *et al.* 1998, p. 66; Guedes and Harper 1995, p. 395). Today, the

species is limited to three areas totaling approximately 537,000 square kilometers (km<sup>2</sup>), (207,337 square miles (mi<sup>2</sup>)) almost exclusively within Brazil: (1) Eastern Amazonia in Pará, Brazil, south of the Amazon River along the Tocantins, Xingu, and Tapajós rivers; (2) the Gerais region of northeastern Brazil, including the states of Maranhão, Piauí, Goiás, Tocantins, Bahia, and Minas Gerais; and (3) the Pantanal of Mato Grosso and Mato Grosso do Sul, Brazil, and marginally in Bolivia and Paraguay. These populations of hyacinth macaws inhabit those portions of the species' original range that experienced the least pressure from bird catchers, meat and feather hunters, and agricultural developers (Munn *et al.* 1989, pp. 406–407).

Prior to the arrival of Indians and Europeans to South America, there may have been between 100,000 and 3 million hyacinth macaws (Munn *et al.* 1989, p. 412); however, due to the species' large but patchy range, an estimate of the original population size when the species was first described (1790) is unattainable (Collar *et al.* 1992, p. 253). Although some evidence indicates that the hyacinth macaw was abundant before the mid-1980s (Guedes 2009, p. 11; Collar *et al.* 1992, p. 253), the species significantly declined throughout the 1980s due to an estimated 10,000 birds illegally captured during the 1980s for the pet trade and a further reduction in numbers due to habitat loss and hunting. Population estimates prior to 1986 are lacking, but a very rapid population decline is suspected to have taken place over the last 31 years (three generations) (Birdlife International (BLI) 2014a, unpaginated). In 1986, the total population of hyacinth macaws was estimated to be 3,000, with a range between 2,500 and 5,000 individuals; 750 occurred in Pará, 1,000 in Gerais, and 1,500 in Pantanal (Guedes 2004b, p. 2; Collar *et al.* 1992, p. 253; Munn *et al.* 1989, p. 413). In 2003, the population was estimated at 6,500 individuals; 5,000 of which were located in the Pantanal region, and 1,000–1,500 in Pará and Gerais, combined (BLI 2017, unpaginated; Guedes 2009, p. 11; Brouwer 2004,

unpaginated). Observations of hyacinth macaws in the wild have increased in Paraguay, especially in the northern region (Espinola 2013, pers. comm.), but no quantitative data are available. Locals report the species increasing in Bolivia; between 100 and 200 hyacinth macaws are estimated to occur in the Bolivian Pantanal, with estimates up to 300 for the country (Guedes 2012, p. 1; Pinto-Ledezma 2011, p. 19; BLI 2017, unpaginated; BLI 1992, p. 4).

The 2003 estimate indicates a substantial increase in the Pantanal population, although the methods or techniques used to estimate the population is not described. Therefore, the reliability of the estimation techniques, as well as the accuracy of the estimated increase, is not known (Santos, Jr. 2013, pers. comm.). Despite the uncertainty in the estimated population increase, the Pantanal is the stronghold for the species and has shown signs of recovery since 1990, most likely as a response to conservation projects (BLI 2017, unpaginated; Antas *et al.* 2006, p. 128; Pinho and Nogueira 2003, p. 30). The overall population trend for the hyacinth macaw throughout its range is reported as decreasing (BLI 2016, unpaginated), although there are no extreme fluctuations reported in the number of individuals (BLI 2016, unpaginated).

### *Essential Needs of the Species*

Hyacinth macaws use a variety of habitats in the Pará, Gerais, and Pantanal regions. Each region features a dry season that prevents the growth of extensive closed-canopy tropical forests and maintains the more open habitat preferred by this species. In Pará, the species prefers palm-rich várzea (flooded forests), seasonally moist forests with clearings, and savannas. In the Gerais region, hyacinth macaws are located within the Cerrado biome, where they inhabit dry open forests in rocky, steep-sided valleys and plateaus, gallery forests (a stretch of forest along a river in an area of otherwise open country), and *Mauritia* palm swamps. In the Pantanal region,



hyacinth macaws frequent gallery forests and palm groves with wet grassy areas (Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 395; Munn *et al.* 1989, p. 407).

Hyacinth macaws have a specialized diet consisting of the fruits of various palm species, which are inside an extremely hard nut that only the hyacinth macaw can easily break (Guedes and Harper 1995, p. 400; Collar *et al.* 1992, p. 254). Hyacinth macaws are highly selective in choice of palm nut; they have to be the right size and shape, as well as have an extractable kernel with the right lignin pattern (Brightsmith 1999, p. 2; Pittman 1993, unpaginated). They forage for palm nuts and water on the ground, but may also forage directly from the palm tree and drink fluid from unripe palm fruits. Hyacinth macaws also feed on the large quantities of nuts eliminated by cattle in the fields and have been observed in close proximity to cattle ranches where waste piles are concentrated (Juniper and Parr 1998, p. 417; Yamashita 1997, pp. 177, 179; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, p. 254).

In each of the three regions where hyacinth macaws occur, they use only a few specific palm species. In Pará, hyacinth macaws have been reported to feed on *Maximiliana regia* (inajá), *Orbignya martiana* (babassu), *Orbignya phalerata* (babacú) and *Astrocaryum* sp. (tucumán). In the Gerais region, hyacinth macaws feed on *Attalea funifera* (piacava), *Syagrus coronata* (catolé), and *Mauritia vinifera* (buriti). In the Pantanal region, hyacinth macaws feed exclusively on *Scheelea phalerata* (acuri) and *Acrocomia totai* (bocaiúva) (Antas *et al.* 2006, p. 128; Schneider *et al.* 2006, p. 74; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 401; Collar *et al.* 1992, p. 254; Munn *et al.* 1989, pp. 407–408). Although hyacinth macaws prefer bocaiúva palm nuts over acuri, bocaiúva is only readily available from September to December, which coincides with the peak of chick hatching; however, the acuri is available throughout the

year and constitutes the majority of this species' diet in the Pantanal (Guedes and Harper 1995, p. 400).

Hyacinth macaws have specialized nesting requirements. As a secondary tree nester, they require large, mature trees with preexisting tree holes to provide nesting cavities large enough to accommodate them (Tortato and Bonanomi 2012, p. 22; Guedes 2009, pp. 4–5, 12; Pizo *et al.* 2008, p. 792; Abramson *et al.* 1995, p. 2). In Pará, the species nests in holes of *Bertholettia excelsa* (Brazil nut). In the Gerais region, nesting may occur in large dead *Mauritia vinifera* (buriti), but is most commonly found in natural rock crevices. In the Pantanal region, the species nests almost exclusively in *Sterculia striata* (manduvi) as it is one of the few tree species that grows large enough to supply cavities that can accommodate the hyacinth's large size. Manduvi trees must be at least 60 years old, and on average 80 years old, to provide adequate cavities (Guedes 2009, pp. 59–60; Pizo *et al.* 2008, p. 792; Santos Jr. *et al.* 2006, p. 185). Nesting has also been reported in *Pithecellobium edwalii* (angio branco), *Enterolobium contortisiliquum* (ximbuva), *Vitex* sp. (tarumá), and the cliff face of mountains on the border of the Pantanal (van der Meer 2013, p. 24; Guedes 2004b, p. 6; Kuniy *et al.* 2006, p. 381; Santos Jr. *et al.* 2006, p. 180; Pinho and Nogueira 2003, pp. 30, 33; Guedes 2002, p. 4; Juniper and Parr 1998, p. 417; Guedes and Harper 1995, p. 402; Collar *et al.* 1992, p. 255; Munn *et al.* 1989, p. 408).

### *Conservation Status*

In 1989, the hyacinth was listed on the Official List of Brazilian Fauna Threatened with Extinction by the Brazilian Institute of Environment and Natural Resources (IBAMA), the government agency that controls the country's natural resources (Lunardi *et al.* 2003, p. 283; IBAMA Ordinance No. 1522, of December 19, 1989). Due to actions to combat trafficking of animals, the hyacinth macaw was removed from the list in 2014 (Instituto Chico Mendes de

Conservação da Bioversidade 2016, unpaginated). It is listed as “critically endangered” by the State of Minas Gerais and “vulnerable” by the State of Pará (Garcia and Marini 2006, p. 153). In Paraguay, the hyacinth macaw is listed as in danger of extinction (Bauer 2012, pers. comm.).

From 2000 to 2013, this species was classified as “endangered” by the International Union for Conservation of Nature (IUCN). However, in 2014, the hyacinth macaw was downlisted to “vulnerable” because evidence suggested that it had not declined as rapidly as previously thought. A “vulnerable” taxon is considered to be facing a high risk of extinction in the wild, whereas an “endangered” taxon is considered to be facing a very high risk of extinction in the wild (IUCN 2012, unpaginated). The hyacinth macaw is also listed as Appendix I on the CITES list. Species included in CITES Appendix I are considered threatened with extinction, and international trade is permitted only under exceptional circumstances, which generally precludes commercial trade.

### **Factors Affecting the Species**

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations in title 50 of the Code of Federal Regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

Most of the information on the hyacinth macaw is from the Pantanal region, as this is the largest and most studied population. The species occurs only marginally within Bolivia and Paraguay as extensions from the Brazilian Pantanal population, and there is little information on

the species in those countries. We found little information on the status of the Pará and Gerais populations; therefore, we evaluated impacts to these populations by a broader region (e.g., the Amazon biome for Pará and the Cerrado biome for Gerais).

Parrots in general have traits that increase their vulnerability of extinction (Lee 2010, p. 3; Thiollay 2005, p. 1121; Guedes 2004a, p. 280; Wright *et al.* 2001, p. 711; Munn *et al.* 1989, pp. 407–409). The specialized nature and reproductive biology of the hyacinth macaw contribute to low recruitment of juveniles and decrease the ability to recover from reductions in population size caused by anthropogenic disturbances (Faria *et al.* 2008, p. 766; Wright *et al.* 2001, p. 711). This species' vulnerability to extinction is further impacted by deforestation that negatively affects the availability of essential food and nesting resources; hunting that removes individuals from already small populations; and other factors that further reduce naturally low reproductive rates, recruitment, and the population. Additionally, the hyacinth macaw has highly specialized food and nest-site requirements (Faria *et al.* 2008, p. 766; Pizo *et al.* 2008, p. 795; Munn *et al.* 1998, p. 409; Johnson *et al.* 1997, p. 186; Guedes and Harper 1995, p. 400), as they feed on and nest in very limited number of tree species. Therefore, hyacinth macaws are particularly vulnerable to extinction due to the loss of food sources and nesting sites (Faria *et al.* 2008, p. 766; Pizo 2008, p. 795; Munn *et al.* 1989, pp. 407–409; Johnson *et al.* 1997, p. 186).

*Factor A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range*

Deforestation

Natural ecosystems across Latin America are being transformed due to economic development, international market demands, and government policies. In Brazil, demand for soybean oil and soybean meal has increased, causing land conversion to significantly increase to

meet this demand (Barona *et al.* 2010, pp. 1–2). Much of the recent surge in cropland area expansion is taking place in the Brazilian Amazon and Cerrado regions (Nepstad *et al.* 2008, p. 1738). Brazil has also become the world’s largest exporter of beef. Over the past decade, more than 10 million hectares (ha) (24.7 million acres (ac)) were cleared for cattle ranching, and the government is aiming to double the country’s share of the beef export market to 60 percent by 2018 (Butler 2009, unpaginated).

*Pará*: Pará is one of the Brazilian states that constitute the Amazon biome (Greenpeace 2009, p. 2). This biome contains more than just the well-known tropical rainforests; it also encompasses other ecosystems, including floodplain forests and savannas. Between 1995 and 2009, conversion of floodplain forests in the Amazon region to cattle ranching expanded significantly and was the greatest cause of deforestation (da Silva 2009, p. 3; Lucas 2009, p. 1; Collar *et al.* 1992, p. 257).

Cattle ranching has been present in the várzea (floodplain forests) of the Amazon for centuries (Arima and Uhl, 1997, p. 433). However, since the late 1970s, state subsidies and massive infrastructure development have facilitated large-scale forest conversion and colonization for cattle ranching (Barona *et al.* 2010, p. 1). Certain factors have led to a significant expansion of this land use. The climate of the Brazilian Amazon is favorable for cattle ranching; frosts do not occur in the north of Brazil; and rainfall is more evenly distributed throughout the year, increasing pasture productivity and reducing the risk of fire. Additionally, the price of land in Pará has been lower than in central and south Brazil, resulting in ranchers establishing larger farms in Pará (Arima and Uhl, 1997, p. 446).

Although the immediate cause of deforestation in the Amazon was predominantly the expansion of pasture between 2000 and 2006 (Barona *et al.* 2010, p. 8), the underlying cause

may be the expansion of soy cultivation in other areas, leading to a displacement of pastures farther north into parts of Pará and causing additional deforestation (Barona *et al.* 2010, pp. 6, 8).

In the Brazilian North region, including Pará, cattle occupy 84 percent of the total area under agricultural and livestock uses. This area, on average, expanded 9 percent per year over 10 years, causing 70–80 percent of deforestation (Nepstad *et al.* 2008, p. 1739). Pará itself contains two-thirds of the Brazilian Amazonia cattle herd (Arima and Uhl 1997, p. 343), with a sizable portion of the state classified as cattle-producing area (Walker *et al.* 2009, p. 69). For 7 months of the year, cattle are grazed in the várzea, but are moved to the upper terra firma the other 5 months (Arima and Uhl, 1997, p. 440). Intense livestock activity can affect seedling recruitment via trampling and grazing. Cattle also compact the soil such that regeneration of forest species is severely reduced (Lucas 2009, pp. 1–2). This type of repeated disturbance can lead to an ecosystem dominated by invasive trees, grasses, bamboo, and ferns (Nepstad *et al.* 2008, p. 1740).

Pará has long been known as the epicenter of illegal deforestation (Dias and Ramos 2012, unpaginated) and has one of the highest deforestation rates in the Brazilian Amazon (Butler 2016, unpaginated). From 1988 to 2016, the state lost 143,159 km<sup>2</sup> (55,274 mi<sup>2</sup>), with annual rates varying between 1,741 and 8,870 km<sup>2</sup> (672 and 3,425 mi<sup>2</sup>) (Brazil's National Institute for Space Research (INPE) 2016, unpaginated; Butler 2016, unpaginated) (Table 1). Since 2004, deforestation rates in Pará have generally decreased. However, rates rose 35 percent in 2013, decreased in 2014, and increased in 2015 and 2016 (INPE 2016, unpaginated) (Table 1). The impacts to and loss of biodiversity within the two large regions of the Brazilian Amazon located in the state of Pará are due to not only deforestation across the landscape but also within-forest disturbance, such as wildfire and selective logging, resulting in a loss of biodiversity beyond

what is expected based on deforestation alone. Within-forest disturbance can increase even as deforestation rates fall (Barlow *et al.* 2016, p. 144).

Table 1. Deforestation in Pará (2004–2016) (INPE 2016).

<b>Year</b>	<b>Accumulated Deforested Area (km<sup>2</sup>)</b>	<b>Annual Deforested Area (km<sup>2</sup>)</b>
2004	98,257*	8,870
2005	104,156	5,899
2006	109,815	5,659
2007	115,341	5,526
2008	120,948	5,607
2009	125,229	4,281
2010	128,999	3,770
2011	132,007	3,008
2012	133,748	1,741
2013	136,094	2,346
2014	137,981	1,887
2015	140,134	2,153
2016	143,159	3,025

\*Accumulation since 1988

Given the role cattle ranching plays in national and international markets and the profitability of ranching, significant expansion of cattle herds in the Brazilian Amazon has continued (Walker *et al.* 2009, p. 68). The remaining forested areas of Pará are at risk of being

cleared; Pará is one of the states where most of Brazil's agriculture expansion is taking place (British Broadcasting Company News 2014, unpaginated). Furthermore, modeled future deforestation is concentrated in eastern Amazonia, which includes Pará, where the density of paved highways (existing and planned) will continue to be highest for several decades (Soares-Filho *et al.* 2006, p. 522).

*Gerais*: The Gerais region is within the Cerrado biome, a 2-million-km<sup>2</sup> (772,204-mi<sup>2</sup>) area consisting of plateaus and depressions with vegetation that varies from dense grasslands with sparse shrubs and small trees to almost closed woodland (Pinto *et al.* 2007, p. 14; da Silva 1997, p. 437; Ratter *et al.* 1997, p. 223). In the Cerrado, hyacinth macaws now mostly nest in rock crevices, most likely a response to the destruction of nesting trees (Collar *et al.* 1992, p. 255). These crevices will likely remain constant and are not a limiting factor. However, deforestation for agriculture, primarily soy crops, and cattle ranching threaten the remaining native cerrado vegetation, including palm species the hyacinth macaw relies on as a food source.

Approximately 50 to 80 percent of the original Cerrado vegetation has been lost due to conversion to agriculture and pasture, and the area continues to suffer high rates of habitat loss (Grecchi *et al.* 2015, p. 2865; Beuchle *et al.* 2015, p. 121; WWF 2015, p. 2; Soares-Filho *et al.* 2014, p. 364; Pearce 2011, unpaginated; WWF–UK 2011b, p. 2; Carvalho *et al.* 2009, p. 1393; BLI 2008, unpaginated; Pinto *et al.* 2007, p. 14; Klink and Machado 2005, p. 708; Marini and Garcia 2005, p. 667; WWF 2001, unpaginated; da Silva 1997, p. 446; da Silva 1995, p. 298). From 2002 to 2008, the demand for land conversion in the Cerrado resulted in an annual deforestation rate of more than 14,200 km<sup>2</sup> (5,483 mi<sup>2</sup>) (PROBIO program (Projeto de Conservação e Utilização Sustentável da Diversidade Biológica); Ministério do Meio Ambiente (MMA) 2015, p. 9; WWF–UK 2011b, p. 2; Beuchle *et al.* 2015, p. 117). At this rate, the



vegetation of the Cerrado region was disappearing faster than the Amazon rainforest (Pearce 2011, unpaginated; WWF–UK 2011c, p. 19; Pennington *et al.* 2006, in Beuchle *et al.* 2015, p. 117; Klink and Machado 2005, p. 708; Ratter *et al.* 1997, p. 228). However, the annual deforestation rate from 2008 to 2009 and 2009 to 2010 in the Cerrado slowed by 46 percent and 16 percent respectively (MMA 2015, p. 9; Critical Ecosystem Partnership Fund (CEPF) 2016, p. 145) (Table 2). In a comparison study, the loss of natural vegetation decreased to an estimated 12,949 km<sup>2</sup> (4,999 mi<sup>2</sup>) per year from 2000 to 2005, and 11,812 km<sup>2</sup> (4,560 mi<sup>2</sup>) per year from 2005 to 2010 (Beuchle *et al.* 2015, pp. 124–125).

Since 2008, annual monitoring of deforestation in the Cerrado has taken place through a government program that monitors each of the Brazilian biomes. Compared to the deforestation rates of the early 2000s, deforestation has decreased about 40 percent (CEPF 2016, p. 145). Although the annual rate of deforestation is generally decreasing, the total amount of forested habitat continues to experience a slow and steady decline (MMA 2015, p. 9) (Table 2).

Table 2. Deforestation in the Cerrado (2002–2011).

<b>Years Assessed</b>	<b>Accumulated Deforested Area (km<sup>2</sup>)</b>	<b>Percent (%) of Cerrado Deforested</b>	<b>Annual Deforested Area (km<sup>2</sup>)</b>	<b>Annual Deforestation Rate (%)</b>	<b>Remaining Areas of Natural Vegetation (km<sup>2</sup>)</b>
Up to 2002	890,636	43	–	–	1,148,750
2002-2008	975,710	47.8	14,179	0.69	1,063,676
2008-2009	983,347	48.2	7,637	0.37	1,056,039
2009-2010	989,816	48.5	6,469	0.32	1,049,570
2010-2011	997,063	48.9	7,247	0.35	1,042,323

The remaining natural vegetation of the Cerrado is highly fragmented (only 20 percent of the original biome is considered intact) and continues to be pressured by conversion for soy plantations and extensive cattle ranching (WWF–UK 2011b, p. 2; WWF–UK 2011c, p. 21;

Carvalho *et al.* 2009, p. 1393; BLI 2008, unpaginated). About 6 in every 10 ha (15 of 25 ac) of the Cerrado are suitable for mechanized agriculture (WWF–UK 2011b, p. 2). Maranhão, Tocantins, Piauí, and Bahia, states where hyacinth macaws occur, are undergoing rapid conversion, mostly to soy crops (CEPF 2016, p. 151). In two of these states, deforestation increased by 40 percent in Toncantins (INPE 2016, unpaginated) and by 25 percent in Maranhão (Butler 2016, unpaginated) in 2016 compared to the deforestation rate in 2015. Soy production will continue to grow as the beans have many uses for food, feed, and industry in Brazil and abroad (CEPF 2016, p. 152). Furthermore, the Brazilian government has proposed a 731,735-km<sup>2</sup> (282,524-mi<sup>2</sup>) agricultural development, of which 91 percent occurs in the Cerrado, with little regard for the environment, at least as of 2015 (Clark 2015 and Miranda 2015, in CEPF 2016, p. 95). Additionally, the conversion of land for biofuel production is likely imminent, creating a market for the expansion and establishment of new areas for soy, castor beans, other oil-bearing plants, and sugar cane (Carvalho *et al.* 2009, p. 1400).

Given that the Cerrado is the most desirable biome for agribusiness expansion and contains approximately 40 million ha (99 million ac) of environmental surplus, which is land that exceeds the conservation requirements of the forest code and that could be legally deforested (see Factor D discussion, below) (Soares-Filho *et al.* 2014, p. 364), this region will likely continue to suffer high deforestation rates. Projections for coming decades show the largest increase in agricultural production occurring in the Cerrado (CEPF 2016, p. 145).

*Pantanal:* The Pantanal is a 140,000-km<sup>2</sup> (54,054-mi<sup>2</sup>) seasonally flooded wetland interspersed with higher areas not subject to inundation (cordilleras), covered with cerrado or seasonal forests (Santos Jr. 2008, p. 133; Santos Jr. *et al.* 2007, p. 127; Harris *et al.* 2005, p. 715; Mittermeier *et al.* 1990, p. 103). Transitions during the 1990s to more intensive cattle ranching

methods led to the conversion of more forests to pasture and the introduction of nonnative grasses. Ninety-five percent of the Pantanal is privately owned; 80 percent of the privately owned land is used for cattle ranches, making cattle ranching the predominant economic activity in this region and the greatest cause of habitat loss in the Pantanal (van der Meer 2013, p. 5; Guedes and Vicente 2012, pp. 146–147, 148; Guedes 2009, p. 12; Pizo *et al.* 2008, p. 793; Harris *et al.* 2006, pp. 165, 175–176; Harris *et al.* 2005, pp. 715–716, 718; Pinho and Nogueira 2003, p. 30; Seidl *et al.* 2001, p. 414; Guedes and Harper 1995, p. 396; Mittermeier 1990, pp. 103, 107–108).

Manduvi, the tree that hyacinth macaws almost exclusively use for nesting in this region, grow in cordilleras, which constitute only 6 percent of the vegetative area of the Pantanal (van der Meer 2013, p. 6; Pizo *et al.* 2008, p. 793; Johnson *et al.* 1997, p. 186). Many of these patches and corridors are surrounded by seasonally flooded grasslands used as rangeland for cattle during the dry season (Johnson *et al.* 1997, p. 186). During the flooding season (January to June), up to 80 percent of the Pantanal is flooded and ranchers move cattle to cordilleras, increasing cattle pressure on upland forests (van der Meer 2013, p. 3; Guedes 2002, p. 3). These upland forests are often removed and converted to cultivated pastures with exotic grasses (van der Meer 2013, p. 6; Santos Jr. 2008, p. 136; Santos Jr. *et al.* 2007, p. 127; Harris *et al.* 2006, p. 165; Harris *et al.* 2005, p. 716; Pinho and Nogueira 2003, p. 30; Seidl *et al.* 2001, p. 414; Johnson *et al.* 1997, p. 186). Clearing land to establish pasture is perceived as the economically optimal land use, while land not producing beef is often perceived as unproductive (Seidl *et al.* 2001, pp. 414–415).

Since 2002, regular monitoring of land use and vegetative cover in the Upper Paraguay Basin, which includes the Pantanal, has taken place. While the annual rate of deforestation is

decreasing, satellite monitoring of the area indicates a slow and steady increase in deforested area (Table 3, below).

Table 3. Deforestation in the Pantanal (2002–2014).

<b>Years Assessed</b>	<b>Accumulated Deforested Area (km<sup>2</sup>)</b>	<b>Percent (%) of Pantanal Deforested</b>	<b>Annual Deforested Area (km<sup>2</sup>)</b>	<b>Annual Deforestation Rate (%)</b>	<b>Citation</b>
2002-2008	20,265	13.4	612	0.41	CI <i>et al.</i> 2009, pp. 30–32
2008-2010	20,851	13.8	605	0.40	CI <i>et al.</i> 2011, pp. 3–4
2010-2012	20,833	13.8	389	0.26	CI <i>et al.</i> 2013, pp. 4–5
2012-2014	22,439	14.9	394	0.26	CI <i>et al.</i> 2015, pp. 2–4

When clearing land for pastures, palm trees are often left, as the cattle will feed on the palm nuts (Pinho and Nogueira 2003, p. 36). In fact, hyacinth macaws occur near cattle ranches and feed off the palm nuts eliminated by the cattle (Juniper and Parr 1998, p. 417; Yamashita 1997, pp. 177, 179; Guedes and Harper 1995, pp. 400–401; Collar *et al.* 1992, p. 254). However, other trees, including potential nesting trees, are often removed (Snyder *et al.* 2000, p. 119). Even in areas where known nesting trees were left and the surrounding area was cleared, competition with each other and other macaw species became so fierce that hyacinth macaws were unable to reproduce; both eggs and chicks were killed by competitors (see Factor C discussion, below).

Other activities associated with cattle ranching, such as grazing, burning, compaction, the introduction of exotic grasses, and fragmentation, negatively impacts the nesting trees of the hyacinth macaw (Guedes 2013, pers. comm.; Guedes and Vicente 2012, pp. 149–150; Santos Jr. *et al.* 2007, p. 128; Harris *et al.* 2006, p. 175; Snyder *et al.* 2000, p. 119). For example, fire is a common method for renewing pastures, controlling weeds, and controlling pests (e.g., ticks);

however, fires frequently become uncontrolled and burn patches and corridors of manduvi trees during the dry season (Harris *et al.* 2005, p. 716; Johnson *et al.* 1997, p. 186). Although fire can promote cavity formation in manduvi trees, frequent fires prevent trees from surviving to a size capable of providing suitable cavities, and cause a high rate of nesting-tree loss (Guedes 1993 in Johnson *et al.* 1997, p. 187). Five percent of manduvi trees are lost each year to deforestation, fire, and storms (Guedes 1995, in Santos Jr. *et al.* 2006, pp. 184–185; Guedes and Vicente 2012, p. 157).

In addition to the impact of fire on recruitment of manduvi trees, cattle directly impact the density of manduvi seedlings in the Pantanal. Cattle forage on and trample manduvi seedlings, affecting the recruitment of this species to be able to reach a size large enough to accommodate hyacinth macaws (Pizo *et al.* 2008, p. 793; Johnson *et al.* 1997, p. 187; Mittermeier *et al.* 1990, p. 107). Only those manduvi trees at least 60 years old are capable of providing these cavities (Pizo *et al.* 2008, p. 792; Santos Jr. *et al.* 2006, p. 185). The minimum diameter at breast height (DBH) for trees to potentially contain a cavity suitable for hyacinth macaws is 50 centimeters (cm) (20 in), while all manduvi trees greater than 100 cm (39 in) DBH contain suitable nest cavities. However, there is low recruitment of manduvi trees in classes greater than 5 cm (2 in) DBH, a strong reduction in the occurrence of trees greater than 50 cm (20 in) DBH, and very few trees greater than 110 cm (43 in) DBH (Santos Jr. *et al.* 2007, p. 128). Only 5 percent of the existing adult manduvi trees (trees with a DBH greater than 50 cm (20 in)) in south-central Pantanal (Guedes 1993, in Johnson *et al.* 1997, p. 186) and 11 percent in southern Pantanal (van der Meer 2013, p. 16) contain suitable cavities for hyacinth macaws. Thus, potential nesting sites are rare and will become increasingly rare in the future (Santos Jr. *et al.* 2007, p. 128).

*Impacts of Deforestation:* Because the hyacinth macaw has highly specialized diet and nesting requirements, it is particularly vulnerable to the loss of these resources (Faria *et al.* 2008, p. 766; Pizo 2008, p. 795; Munn *et al.* 1989, pp. 407–409; Johnson *et al.* 1997, p. 186). The loss of tree species used by hyacinth macaws negatively impacts the species by reducing availability of food resources, creating a shortage of suitable nesting sites, increasing competition, and resulting in lowered recruitment and a reduction in population size (Lee 2010, pp. 2, 6, 12; Santos Jr. *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188).

Its specialized diet makes the hyacinth macaw vulnerable to changes in food availability. Inadequate nutrition can contribute to poor health and reduced reproduction in parrots generally (McDonald 2003, in Lee 2010, p. 6). Changes in palm fruit availability decreases reproduction in hyacinth macaws (Guedes 2009, pp. 42–43, 44). In Pará and the Gerais region, where food sources are threatened, persistence of the species is a concern given that one of the major factors thought to have contributed to the critically endangered status of the Lear's macaw (*Anodorhynchus leari*) is the loss of its specialized food source, *Syagrus* sp. (licuri palm) stands, to cattle grazing (Collar *et al.* 1992, p. 257).

Hyacinth macaws can tolerate a certain degree of human disturbance at their breeding sites (Pinho and Nogueira 2003, p. 36). However, the number of usable cavities increases with the age of the trees in the forest (Newton 1994, p. 266), and clearing land for agriculture and cattle ranching, cattle trampling and foraging, and burning of forest habitat result in the loss of mature trees with natural cavities of sufficient size and a reduction in recruitment of native species that could eventually provide nesting cavities.

A shortage of nest sites can jeopardize the persistence of the hyacinth macaw by constraining breeding density, resulting in lower recruitment and a gradual reduction in

population size (Santos Jr. *et al.* 2007, p. 128; Johnson *et al.* 1997, p. 188; Guedes and Harper 1995, p. 405; Newton 1994, p. 265). This reduction may lead to long-term effects on the viability of the hyacinth macaw population, especially in Pará and the Pantanal where persistence of nesting trees is compromised (Santos Jr. *et al.* 2007, p. 128; Santos Jr. *et al.* 2006, p. 181). Although a species may survive the initial deforestation, the resulting lack of food resources and breeding sites may reduce the viability of the population and make the species vulnerable to extinction (Sodhi *et al.* 2009, p. 517).

In response to the loss of its nesting tree in the Gerais region, hyacinth macaws now use rock crevices for nesting. Hyacinth macaws have been reported in various trees species and even on cliffs on the border of the Pantanal, although the majority of their nests are in Brazil nut (in Pará) and manduvi (in the Pantanal) (see *Essential Needs of the Species*, above). We do not know if the hyacinth macaws in the Pantanal will respond in the same way to the loss of nesting trees as those in the Gerais region; however, it is possible that if these primary nesting trees become scarcer, hyacinth macaws may adapt to using cliff faces or cavities of other trees (van der Meer 2013, p. 3). Deforestation in these regions would likely impact any alternative nesting trees and food sources, resulting in the same negative effect on the hyacinth macaw. Furthermore, competition for limited nesting sites and food would continue.

#### *Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

##### Hunting

In Pará and the Gerais region, hunting removes individual hyacinth macaws vital to the already small populations (Brouwer 2004, unpaginated; Collar *et al.* 1992, p. 257; Munn *et al.* 1989, p. 414). Hyacinth macaws in Pará are hunted for subsistence and the feather trade by some Indian groups (Brouwer 2004, unpaginated; Munn *et al.* 1989, p. 414). Because the hyacinth

macaw is the largest species of macaw, it may be targeted by subsistence hunters, especially by settlers along roadways (Collar *et al.* 1992, p. 257). The Gerais region is poor, and animal protein is not as abundant as in other regions; therefore, meat of any kind, including the large hyacinth macaw, is sought as a protein source (Collar *et al.* 1992, p. 257; Munn *et al.* 1989, p. 414). Additionally, increased commercial sale of feather art by Kayapo Indians of Gorotire may be of concern given that 10 hyacinth macaws are required to make a single headdress (Collar *et al.* 1992, p. 257).

Because the hyacinth macaw populations in Pará and the Gerais region are estimated at only 1,000–1,500 individuals combined, the removal of any individuals from these small populations has a negative effect on reproduction and the ability of the species to recover. Any continued hunting for either meat or for the sale of feather art is likely to contribute to the decline of the hyacinth macaw in these regions, particularly when habitat conversion is also taking place.

Hunting, capture, and trade of animal species are prohibited without authorization throughout the range of the hyacinth macaw (Clayton 2011, p. 4; Snyder *et al.* 2000, p. 119; Environmental Crimes Law (Law No. 9605/98); Stattersfield and Capper 1992, p. 257; Munn *et al.* 1989, p. 415; Official List of Brazilian Endangered Animal Species (Order No. 1.522/1989) (IBAMA 1989); Brazilian Constitution (title VIII, chapter VI, 1988); Brazilian Law No. 5197/1967; UNEP, n.d., unpaginated). However, continued hunting in some parts of its range is evidence that existing laws are not being adequately enforced. Without greater enforcement of laws, hunting will continue to impact the hyacinth macaw (see Factor D discussion, below).

Pet Trade.

In the 1970s and 1980s, substantial trade in hyacinth macaws was reported, but actual trade was likely significantly greater given the amount of smuggling, routing of birds through



countries not parties to CITES, and internal consumption in South America (Collar *et al.* 1992, p. 256; Munn *et al.* 1989, pp. 412–413). Trade in parrots in the 1980s was particularly high due to a huge demand from developed countries, including the United States, which was the main consumer of parrot species at that time (Rosales *et al.* 2007, pp. 85, 94; Best *et al.* 1995, p. 234). In the late 1980s and early 1990s, reports of hyacinth macaw trapping included one trapper who worked an area for 3 years removing 200–300 wild hyacinth macaws a month during certain seasons and another trapper who caught 1,000 hyacinth macaws in 1 year and knew of other teams operating at similar levels (Silva (1989a) and Smith (1991c) in Collar *et al.* 1992, p. 256). More than 10,000 hyacinth macaws are estimated to have been taken from the wild in the 1980s (Smith 1991c, in Collar *et al.* 1992, p. 256; Munn *et al.* 1987, in Guedes 2009, p. 12). In the years following the enactment of the WBCA, studies found lower poaching levels than in prior years, suggesting that import bans in developed countries reduced poaching levels in exporting countries (Wright *et al.* 2001, pp. 715, 718).

Table 4. CITES Trade Database: Approximate number of imports/exports of hyacinth macaw with identified sources and purposes of trade.

<b>Source</b>	<b>Approximate Number of Birds</b>		<b>Purpose</b>	<b>Approximate Number of Birds</b>	
	Importer Reported Quantity	Exporter Reported Quantity		Importer Reported Quantity	Exporter Reported Quantity
Live Total	1,488	1,435	Breeding in Captivity or Artificial Propagation	688	827
Live/Captive Source	1,342	1,356	Educational	29	25
Live/Wild Source	37	14	Hunting Trophy	1	0
Live/Pre-Convention	20	22	Law Enforcement, Judicial, Forensic	0	3
Live/Unknown	13	7	Medical	1	31

Source					
Live/Confiscated	32	3	Reintroduction into Wild	4	0
Live/No Source Identified	44	33	Personal	361	123
<b><u>Total Specimens</u></b>	<b><u>1,661</u></b>	<b><u>1,756</u></b>	Circus or Travelling Exhibition	3	7
			Scientific	35	244
			Commercial	336	348
			Zoo	138	49
			Not Reported	65	99
			<b><u>Total Specimens</u></b>	<b><u>1,661</u></b>	<b><u>1,756</u></b>

The data in Table 4 are based on CITES trade data obtained from the CITES Trade Database (accessed on January 12, 2018), from 1987 through 2015. Because there may be a lag time in the data reported relative to when the hyacinth macaw was uplisted to Appendix I in CITES (October 22, 1987), a few entries in the database between 1987 and 2015 categorize the hyacinth macaw as Appendix II. There are differences in the manner in which the importing and exporting countries report their trade, and some data may be contradictory or incorrectly reported.

We found little additional information on illegal trade of this species in international markets. One study found that illegal pet trade in Bolivia continues to involve CITES-listed species; the authors speculated that similar problems exist in Peru and Brazil (Herrera and Hennessey 2007, p. 298). In that same study, 11 hyacinth macaws were found for sale in a Santa Cruz market from 2004 to 2007 (10 in 2004, and 1 in 2006) (Herrera and Hennessey 2009, pp. 233–234). Larger species, like the hyacinth macaw, were frequently sold for transport outside of the country, mostly to Peru, Chile, and Brazil (Herrera and Hennessey 2009, pp. 233–234). During a study conducted from 2007 to 2008, no hyacinth macaws were recorded in 20 surveyed Peruvian wildlife markets (Gastañaga *et al.* 2010, pp. 2, 9–10). We found no other data on the presence of hyacinth macaws in illegal trade.

Although illegal trapping for the pet trade occurred at high levels during the 1980s, trade has decreased significantly from those levels. International trade of parrots was significantly reduced during the 1990s as a result of tighter enforcement of CITES regulations, stricter measures under European Union legislation, and adoption of the WBCA, along with adoption of national legislation in various countries (Snyder *et al.* 2000, p. 99) (see Factor D discussion, below). We found no information indicating trade is currently impacting the hyacinth macaw.

#### *Factor C. Disease or Predation*

In the Pantanal, predation and disease are factors affecting reproductive success of the hyacinth macaw (Guedes 2009, pp. 5, 8, 42; Guedes 2004b, p. 7). Predation accounted for 52 percent of lost eggs during the incubation period in a 10-year study in the Miranda region of the Pantanal (Guedes 2009, pp. 5, 74). Of the nests that produced chicks, 38 percent of chicks were lost due to predation by species such as carnivorous ants (*Solenopsis* sp.), other insects, collared forest falcon (*Micrastur semitorquatus*), and spectacled owl (*Pulsatrix perspicillata*). The toco toucan (*Ramphastos toco*) and great horned owl (*Bubo virginianus*) are also suspected of chick predation, but this has not yet been confirmed (Guedes 2009, pp. 6, 79–81; Pizo *et al.* 2008, p. 795). Of 582 eggs monitored over 6 years in the Nhecolândia region of the Pantanal, approximately 24 percent (n=138 eggs) were lost to predators (Pizo *et al.* 2008, pp. 794, 795). Several species preyed upon hyacinth macaw eggs, including toco toucans, purplish jays (*Cyanocorax cyanomelas*), white-eared opossums (*Didelphis albiventris*), and coatis (*Nasua nasua*) (Guedes 2009, pp. 5, 23, 46, 58, 74–75; Pizo *et al.* 2008, p. 795). The toco toucan was the main predator, responsible for 12.4 percent of the total eggs lost and 53.5 percent of the eggs lost annually in the Nhecolândia region (Pizo *et al.* 2008, pp. 794, 795). Most predators leave some sort of evidence behind; however, toco toucans swallow hyacinth macaw eggs whole, leaving no

evidence behind. This ability may lead to an underestimate of nest predation by toucans (Pizo *et al.* 2008, p. 793).

Incidence of disease, such as hoof-and-mouth disease and brucellosis, and of ectoparasites, has been observed in hyacinth macaws (Arima and Uhl, 1997, p. 446; Allgayer *et al.* 2009, p. 974). Pará ranchers and technicians concurred that there's a lower incidence of disease (e.g., hoof-and-mouth disease, brucellosis) and ectoparasites in Pará than in central and south Brazil (Arima and Uhl, 1997, p. 446). A study of free-living nestlings from the Pantanal detected ectoparasites in 3 percent and scars in 6 percent of birds, suggesting the occurrence of parasitism. The ectoparasites were identified as *Philornis* sp. (Diptera: Muscidae). However, the absence of blood and intestinal parasites in samples collected for 4 consecutive years indicates that there is a low prevalence of parasitism in hyacinth macaw nestlings (Allgayer *et al.* 2009, pp. 974, 977).

#### *Factor D. Inadequacy of Existing Regulatory Mechanisms*

##### Brazil

Hunting, capture, and trade of animal species are prohibited without authorization (Environmental Crimes Law (Law No. 9605/98)). In general, wildlife species and their nests, shelters, and breeding grounds are subject to Brazilian laws designed to provide protection (Clayton 2011, p. 4; Snyder *et al.* 2000, p. 119; Environmental Crimes Law (Law No. 9605/98); Stattersfield and Capper 1992, p. 257; IBAMA 1989; Brazilian Constitution (title VIII, chapter VI, 1988); Brazilian Law No. 5197/1967; United Nations Environment Programme (UNEP), n.d., unpaginated). The forests of Brazil are specifically subject to several Brazilian laws designed to protect them. Destruction and damaging of forest reserves, cutting trees in forest

reserves, and causing fire in forests, among other actions, without authorization are prohibited (Clayton 2011, p. 5; Environmental Crimes Law (Law No. 9605/98); UNEP, n.d., unpaginated).

*Protected Areas:* The main biodiversity protection strategy in Brazil is the creation of Protected Areas (National Protected Areas System) (Federal Act 9.985/00) (Santos Jr. 2008, p. 134). Various regulatory mechanisms (Law No. 11.516, Act No. 7.735, Decree No. 78, Order No. 1, and Act No. 6.938) in Brazil direct Federal and State agencies to promote conservation of the country's natural resources through protection of lands and the establishment and management of protected areas (ECOLEX 2007, pp. 5–7). These mechanisms generally aim to protect endangered wildlife and plant species, genetic resources, overall biodiversity, and native ecosystems on Federal, State, and privately owned lands (e.g., Law No. 9.985, Law No. 11.132, Resolution No. 4, and Decree No. 1.922). Brazil's Protected Areas were established in 2000, and may be categorized as “strictly protected” or “sustainable use” based on their overall management objectives. Strictly protected areas include national parks, biological reserves, ecological stations, natural monuments, and wildlife refuges protected for educational and recreational purposes and scientific research. Protected areas of sustainable use (national forests, environmental protection areas, areas of relevant ecological interest, extractive reserves, fauna reserves, sustainable development reserves, and private natural heritage reserves) allow for different types and levels of human use with conservation of biodiversity as a secondary objective. As of 2005, Federal and State governments strictly protected 478 areas totaling 37,019,697 ha (14,981,340 ac) in Brazil (Rylands and Brandon 2005, pp. 615–616). Other types of areas contribute to the Brazilian Protected Areas System, including indigenous reserves and areas managed and owned by municipal governments, nongovernmental organizations, academic institutions, and private sectors (Rylands and Brandon 2005, p. 616).

The Amazon contains a balance of strictly prohibited protected areas (49 percent of protected areas) and sustainable use areas (51 percent) (Rylands and Brandon 2005, p. 616). We found no information on the occurrence of the hyacinth macaw in any protected areas in Pará. The Cerrado biome is one of the most threatened biomes and is underrepresented among Brazilian protected areas; only 2.25 percent of the original extent of the Cerrado is protected (Marini *et al.* 2009, p. 1559; Klink and Machado 2005, p. 709; Siqueira and Peterson 2003, p. 11). Within the Cerrado, the hyacinth macaw is found within the Araguaia National Park in Goiás and the Parnaíba River Headwaters National Park (BLI 2014b; Ridgely 1981, p. 238). In 2000, the Pantanal was designated as a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (Santos Jr. 2008, p. 134). Only 4.5 percent of the Pantanal is categorized as protected areas (Harris *et al.* 2006, pp. 166–167), including strictly protected areas and indigenous areas (Klink and Machado 2005, p. 709). Within these, the hyacinth macaw occurs only within the Pantanal National Park (Collar *et al.* 1992; Ridgely 1981, p. 238). The distribution of Federal and State protected areas are uneven across biomes, yet all biomes need substantially more area to be protected to meet the recommendations established in priority-setting workshops held by Brazil’s Ministry of the Environment. These workshops identified 900 areas for conservation of biodiversity and all biomes, including the Amazon, Cerrado, and Pantanal (Rylands and Brandon 2005, pp. 615–616).

The Ministry of Environment is working to increase the amount of protected areas in the Pantanal and Cerrado regions; however, the Ministry of Agriculture is looking at using an additional 1 million km<sup>2</sup> (386,102 mi<sup>2</sup>) for agricultural expansion, which will speed up deforestation (Harris *et al.* 2006, p. 175). These competing priorities make it difficult to enact and enforce regulations that protect the habitat of this species. Additionally, after the creation of

protected areas, a delay in implementation or a lack of local management commitment often occurs, staff limitations make it difficult to monitor actions, and a lack of acceptance by society or a lack of funding make administration and management of the area difficult (Santos Jr. 2008, p. 135; Harris *et al.* 2006, p. 175). Furthermore, ambiguity in land titles allows illegal occupation and clearing of forests in protected areas, such as federal forest reserves (Schiffman 2015, unpaginated). The designation of the Pantanal as a Biosphere Reserve is almost entirely without merit because of a lack of commitment by public officials (Santos Jr. 2008, p. 134).

Awareness of the urgency in protecting the biodiversity of the Cerrado biome is increasing (Klink and Machado 2005, p. 710). The Brazilian Ministry of the Environment's National Biodiversity Program and other government-financed institutes, such as the Brazilian Environmental Institute, Center for Agriculture Research in the Cerrado, and the National Center for Genetic Resources and Biotechnology, are working together to safeguard the existence and viability of the Cerrado. Additionally, nongovernmental organizations such as Fundação Pró-Natureza, Instituto Sociedade População e Natureza, and World Wildlife Fund have provided valuable assessments and are pioneering work in establishing extractive reserves (Ratter *et al.* 1997, pp. 228–229). Other organizations are working to increase the area of federal Conservation Units, a type of protected area, that currently represent only 1.5 percent of the biome (Ratter *et al.* 1997, p. 229).

The Brazilian government, under its Action Plan for the Prevention and Control of Deforestation and Burning in the Cerrado—Conservation and Development (PPCerrado) (2010), committed to recuperating at least 8 million ha (20 million ac) of degraded pasture by the year 2020, reducing deforestation by 40 percent in relation to the average recorded between 1999 and 2008, decreasing forest fires, expanding sustainable practices, and monitoring remaining natural

vegetation. It also planned to expand the areas under protection in the Cerrado to 2.1 million ha (5 million ac) (Ribeiro *et al.* 2012, p. 11; WWF–UK 2011b, p. 4). This plan is based off the success of the Plan of Action for Prevention and Control of Deforestation in the Legal Amazon (PPCDAm), which has reduced the deforestation rate by approximately 80 percent in relation to the 2004 rate (Department of Policies to Combat Deforestation 2016, p. 6).

Both plans since their inception have achieved important results. The PPCDAm started in 2004 and PPCerrado in 2010. Results achieved for the PPCDAm include, but are not limited to: 50 million ha (124 million ac) of protected areas; sustainable agriculture—low carbon agriculture; improvements of the monitoring systems; strengthening inspection with integrated actions between IBAMA, Federal Police, Army and National Force of Public Security; and a moratorium of soybean production in illegally deforested areas in the Amazon (Department of Policies to Combat Deforestation 2016, pp. 11–12). Results achieved by the PPCerrado include: Development (in progress) of land-cover monitoring systems to guide the preparation of public policies and support enforcement actions for this biome; development of a rural environmental registry; integrated fire management in conservation units; development of monitoring systems for burned areas and deforestation; sustainable agriculture—low carbon agriculture; environmental inspection, with 20,000 embargoed areas and \$75 million of fines, including 287 inspection operations in protected areas, indigenous lands, highways, and steel industries; and training of 2,400 families for forest and community management (Department of Policies to Combat Deforestation 2016, pp. 8–9). Moreover, the plan has influenced and guides a series of public policies, programs, and projects implemented in the Cerrado, including international cooperation projects in line with the objectives of the PPCerrado. In 2015, the third phase of the PPCDAm (2012–2015) and the second phase of the PPCerrado (2014–2015) was completed. The



next phase of the PPCerrado will guide federal actions in the period 2016–2020, with the main indicator as the annual deforestation rate in the Cerrado biome (Department of Policies to Combat Deforestation 2016, p. 16).

We do not have information on the deforestation rate in the Cerrado biome in relation to the implementation of the PPCerrado. However, Brazil has obtained significant reduction of the deforestation rate after 12 years of the PPCDAm and 6 years of PPCerrado, with most of the reduction occurring within the Amazon basin. Challenges persist, along with the need for strengthened and innovative actions (Department of Policies to Combat Deforestation 2016, p. 7).

Many challenges limit the effectiveness of the protected areas system. Brazil is faced with competing priorities of encouraging development for economic growth and resource protection. In the past, the Brazilian government, through various regulations, policies, incentives, and subsidies, has actively encouraged settlement of previously undeveloped lands, which facilitated the large-scale habitat conversions for agriculture and cattle-ranching that occurred throughout the Amazon, Cerrado, and Pantanal biomes (WWF–UK 2011b, p. 2; WWF 2001, unpaginated; Arima and Uhl, 1997, p. 446; Ratter *et al.* 1997, pp. 227–228). The risk of intense wild fires may increase in areas, such as protected areas, where cattle are removed and the resulting accumulation of plant biomass serves as fuel (Santos Jr. 2013, pers. comm.; Tomas *et al.* 2011, p. 579).

The states where the hyacinth macaw occurs contain 53 protected areas (Parks.it, n.d., unpaginated). However, the species occurs in only three National Parks within those protected areas; none of these areas is effectively protected (BLI 2014b, unpaginated; Collar *et al.* 1992, p. 257; Rogers 2006, unpaginated; Ridgely 1981, p. 238). The hyacinth macaw continues to be

hunted in Pará and the Gerais region, and habitat loss due to agricultural expansion and cattle ranching is occurring in all three regions. Therefore, it appears that Brazil's protected areas system does not adequately protect the hyacinth macaw or its habitat, either because the species is found outside the protected areas or not adequately protected within them.

*Farmland Environmental Registry:* The Ministry of Environment and The Nature Conservancy have worked together to implement the Farmland Environmental Registry to curb illegal deforestation in the Amazon, which in turn would reduce impacts to species such as the hyacinth macaw that are negatively affected by deforestation. This program was launched in the states of Mato Grosso and Pará; it later became the model for the Rural Environmental Registry that monitors all of Brazil for compliance with the Forest Code (see discussion below). This plan helped Paragominas, a municipality in Pará, be the first in Brazil to come off the government's blacklist of top Amazon deforesters. After 1 year, 92 percent of rural properties in Paragominas had been entered into the registry, and deforestation was cut by 90 percent (Dias and Ramos 2012, unpaginated; Vale 2010, unpaginated). In response to this success, Pará launched its Green Municipalities Program in 2011. The purpose of this project is to reduce deforestation in Pará by 80 percent by 2020, and strengthen sustainable rural production. To accomplish this goal, the program seeks to create partnerships between local communities, municipalities, private initiatives, IBAMA, and the Federal Public Prosecution Service and to focus on local pacts, deforestation monitoring, implementation of the Rural Environmental Registry, and structuring municipal management (Veríssimo *et al.* 2013, pp. 3, 6, 12–13). The program aims to show how it is possible to develop a new model for an activity identified as a major cause of deforestation (Dias and Ramos 2012, unpaginated; Vale 2010, unpaginated).

*Forest Code:* Brazil's Forest Code, passed in 1965, is a central component of the nation's environmental legislation; it dictates the minimum percentage and type of woodland that farmers, timber companies, and others must leave intact on their properties (Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated). Since 2001, the Forest Code has required landowners to conserve native vegetation on their rural properties. This requirement includes setting aside a Legal Reserve that comprises 80 percent of the property if it is located in the Amazon and 20 percent in other biomes. The Forest Code also designated environmentally sensitive areas as Areas of Permanent Preservation (APPs) to conserve water resources and prevent soil erosion; APPs include Riparian Preservation Areas to protect riverside forest buffers and Hilltop Preservation Areas to protect hilltops, high elevations, and steep slopes (Soares-Filho *et al.* 2014, p. 363).

For years, this law was widely ignored by landowners and not enforced by the government, as evidenced by the high deforestation rates (Leahy 2011, unpaginated; Pearce 2011, unpaginated; Ratter *et al.* 1997, p. 228). However, as deforestation rates increased in the early 2000s, Brazil began cracking down on illegal deforesters and used satellite imagery to track deforestation, resulting in decreased deforestation rates (Soares-Filho *et al.* 2014, p. 363; Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated; Darlington 2012, unpaginated). Efforts to strengthen enforcement of the Forest Code increased pressure on the farming sector, which resulted in a backlash against the Forest Code and industry's proposal of a new Forest Code (Soares-Filho *et al.* 2014, p. 363).

In 2011, reforms to Brazil's Forest Code were debated in the Brazilian Senate. The reforms were favored by the agricultural industry but were greatly opposed by conservationists. At that time, the expectation of the bill being passed resulted in a spike in deforestation

(Darlington 2012, unpaginated; Moukaddem 2011, unpaginated; WWF–UK 2011a, unpaginated). A new Forest Code was passed in 2012, and although the new reforms were an attempt at a compromise between farmers and environmentalists, many claim the new bill reduces the total amount of land required to be maintained as forest and will increase deforestation, especially in the Cerrado (Soares-Filho *et al.* 2014, p. 364; Boadle 2012, unpaginated; Darlington 2012, unpaginated; Do Valle 2012, unpaginated; Greenpeace 2012, unpaginated).

Stakeholders in favor of stronger conservation opposed the new law due to the complexity of the rule, challenges in implementation, and a lack of adequate protection of Brazil's forests. The new Forest Code carries over conservation requirements for Legal Reserves and Riparian Preservation Areas. However, changes in the definition of Hilltop Preservation Areas reduced their total area by 87 percent. Additionally, due to more flexible protections and differentiation between conservation and restoration requirements, Brazil's environmental debt (areas of Legal Reserve and Riparian Preservation Areas deforested illegally before 2008 that, under the previous Forest Code, would have required restoration at the landowner's expense) was reduced by 58 percent (Soares-Filho *et al.* 2014, p. 363). The legal reserve debt was forgiven for "small properties," which ranged from 20 ha (49 ac) in southern Brazil to 440 ha (1,087 ac) in the Amazon; this provision has resulted in approximately 90 percent of Brazilian rural properties qualifying for amnesty from the restoration requirement.

Further reductions in the environmental debt resulted from: (1) Reducing the Legal Reserve restoration requirement from 80 percent to 50 percent in Amazonian municipalities that are predominately occupied by protected areas; (2) including Riparian Preservation Areas in the calculation of the Legal Reserve area (total area they are required to preserve); and (3) relaxing

Riparian Preservation Area restoration requirements on small properties. These new provisions effectively reduced the total amount of land farmers are required to preserve and municipalities and landowners are required to restore. Reductions were uneven across states and biomes, with the Amazon and Cerrado biomes being two of the three biomes most affected and vulnerable to deforestation.

Altogether, provisions of the new Forest Code have reduced the total area to be restored from approximately 50 million ha (124 million ac) to approximately 21 million ha (52 million ac) (Soares-Filho *et al.* 2014, p. 363; Boadle 2012, unpaginated). Furthermore, the old and new Forest Codes allow legal deforestation of an additional 88 million ha (217 million ac) on private properties deemed to constitute an “environmental surplus,” which are areas that are not conserved by the Legal Reserve and Riparian Preservation Area conservation requirements. The Cerrado alone contains approximately 40 million ha (99 million ac) of habitat designated as environmental surplus that could be legally deforested (Soares-Filho *et al.* 2014, p. 364).

Although the Forest Code reduces restoration and preservation requirements, which in turn increases the threat to the hyacinth macaw, it introduces new mechanisms to address fire management, forest carbon, and payments for ecosystem services, which could reduce deforestation and result in environmental benefits to the hyacinth macaw. The most important mechanism may be the Environmental Reserve Quota (ERQ). The ERQ is a tradable legal title to areas with intact or regenerating native vegetation exceeding the Forest Code requirements. It provides the opportunity for landowners who, as of July 2008, did not meet the area-based conservation requirements of the law, to instead “compensate” for their legal reserve shortages by purchasing surplus compliance obligations from properties that would then maintain native vegetation in excess of the minimum legal reserve requirements. This mechanism could provide

forested lands with monetary value, creating a trading market. The ERQ could potentially reduce 56 percent of the Legal Reserve debt (Soares-Filho *et al.* 2014, p. 364).

The new Forest Code requires landowners to take part in a mapping and registration system for rural properties that serves as a means for landowners to report their compliance with the code in order to remain eligible for state credit and other government support. On May 6, 2014, the Ministry for the Environment published a regulation formally implementing the mapping system and requiring all rural properties be enrolled by May 2015. However, on May 5, 2015, the deadline was extended to May 4, 2016. According to information provided by the Ministry for the Environment, at that time 1,407,206 rural properties had been registered since the new code became effective. This number covers an area of 196,767,410 ha (486,222,859 ac) and represents 52 percent of all rural areas in Brazil for which registration is mandatory (Filho *et al.* 2015, unpaginated). This system could facilitate the market for ERQs and payments for ecosystem services.

It is unclear whether the Brazilian Government will be able to effectively enforce the new law (Barrionuevo 2012, unpaginated; Boadle 2012, unpaginated; Greenpeace 2012, unpaginated). The original code was largely ignored by landowners and not enforced, leading to Brazil's high rates of deforestation (Boadle 2012, unpaginated). Although Brazil's deforestation rates declined between 2005 and 2010, 2011 marked the beginning of an increase in rates due to the expectation of the new Forest Code being passed. Another slight increase occurred in 2013, then doubled over 6 months (Schiffman 2015, unpaginated). Corruption in the government, land fraud, and lack of penalties for infractions have contributed to increases in illegal deforestation (Schiffman 2015, unpaginated). Additionally, amnesty afforded by the new Forest Code has led to the perception that illegal deforesters are unlikely to be prosecuted or could be exonerated in

future law reforms (Schiffman 2015, unpaginated; Soares-Filho *et al.* 2014, p. 364). Enforcement is often nonexistent in Brazil as IBAMA is underfunded and understaffed. Only 1 percent of the fines imposed on individuals and corporations for illegal deforestation is actually collected (Schiffman 2015, unpaginated). In Pará, one of two states where most of the clearing is occurring, 78 percent of logging between August 2011 and July 2012 was illegal (Schiffman 2015, unpaginated). Furthermore, while much logging is being conducted illegally, there is concern that even if regulations are strictly adhered to, the development is not sustainable (Schiffman 2015, unpaginated). Some level of deforestation is highly likely to continue and will continue to compromise the status of the species

*Additional Regulatory Mechanisms:* To protect the main breeding habitat of the hyacinth macaw, Mato Grosso State Senate passed State Act 8.317 in 2005, which prohibits the cutting of manduvi trees, but not others. Although this law protects nesting trees, other trees around nesting trees are cut, exposing the manduvi tree to winds and storms. Manduvi trees end up falling or breaking, rendering them useless for the hyacinth macaws to nest in (Santos Jr. 2008, p. 135; Santos Jr. *et al.* 2006, p. 186).

#### International Laws

The hyacinth macaw is protected under CITES, an international agreement between governments to ensure that the international trade of CITES-listed plant and animal species does not threaten species' survival in the wild. Under this treaty, CITES Parties (member countries or signatories) regulate the import, export, and re-export of specimens, parts, and products of CITES-listed plant and animal species. Trade must be authorized through a system of permits and certificates that are provided by the designated CITES Management Authority of each CITES Party. Brazil, Bolivia, and Paraguay are Parties to CITES.

The hyacinth macaw was listed in Appendix I of CITES on October 22, 1987. An Appendix-I listing includes species threatened with extinction whose trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The import of an Appendix-I species generally requires the issuance of both an import and export permit. Import permits for Appendix-I species are issued only if findings are made that the import would be for purposes that are not detrimental to the survival of the species and that the specimen will not be used for primarily commercial purposes (CITES Article III(3)). Export permits for Appendix-I species are issued only if findings are made that the specimen was legally acquired and trade is not detrimental to the survival of the species, and if the issuing authority is satisfied that an import permit has been granted for the specimen (CITES Article III(2)).

The import of hyacinth macaws into the United States is also regulated by the Wild Bird Conservation Act (WBCA), which was enacted on October 23, 1992. The purpose of the WBCA is to promote the conservation of exotic birds by ensuring that all imports of exotic birds to the United States are biologically sustainable and not detrimental to the species in the wild. The WBCA generally restricts the importation of most CITES-listed live or dead exotic birds. Import of dead specimens is allowed for scientific purposes and museum specimens. Permits may be issued to allow import of listed birds for various purposes, such as scientific research, zoological breeding or display, or personal pets, when certain criteria are met. The Service may approve cooperative breeding programs and subsequently issue import permits under such programs. Wild-caught birds may be imported into the United States if certain standards are met and they are subject to a management plan that provides for sustainable use. At this time, the hyacinth macaw is not part of a Service-approved cooperative breeding program, and wild-caught birds have not been approved for importation.



The Lacey Act was originally passed in 1900, and was the first Federal law protecting wildlife. Today, it provides civil and criminal penalties for the illegal trade of animals and plants. Under the Lacey Act, in part, it is unlawful to import, export, transport, sell, receive, acquire, or purchase any fish, or wildlife taken, possessed, transported, or sold: (1) In violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law; or (2) in interstate or foreign commerce, any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any State or in violation of any foreign law. Therefore, for example, because the take of wild-caught hyacinth macaws would be in violation of Brazil's Environmental Crimes Law (9605/98), the subsequent import of hyacinth macaws into the United States would be in violation of the Lacey Act. Similarly, under the Lacey Act it is unlawful to import, export, transport, sell, receive, acquire, or purchase specimens of these species traded contrary to CITES.

Although illegal trapping for the pet trade occurred at high levels during the 1980s, trade has decreased significantly from those levels. International trade of parrots was significantly reduced during the 1990s as a result of tighter enforcement of CITES regulations, stricter measures under European Union legislation, and adoption of the WBCA, along with adoption of national legislation in various countries (Snyder et al. 2000, p. 99). We found no information indicating trade is currently impacting the hyacinth macaw population.

Habitat loss for the hyacinth macaw continues despite regulatory mechanisms intended to protect Brazil's forests. The lack of supervision and resources prevent these laws from being properly implemented (Guedes 2012, p. 3), as evidenced by ongoing deforestation in the Amazon, Cerrado, and Pantanal. As described above, the hyacinth macaw's food and nesting trees are removed for agriculture and cattle ranching, and fire is used to clear land and maintain

pastures. Therefore, without greater enforcement of laws, deforestation will continue to impact the hyacinth macaw and its food and nesting resources.

*Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*

Climate Change

Changes in Brazil's climate and associated changes to the landscape may result in additional habitat loss for the hyacinth macaw. Across Brazil, temperatures are projected to increase and precipitation to decrease (Carabine and Lemma 2014, p. 11; Siqueira and Peterson 2003, p. 2). The latest Intergovernmental Panel on Climate Change assessment estimates temperature changes in South America by 2100 to range from 1.7 to 6.7 degrees Celsius (°C) (3.06 to 12.06 degrees Fahrenheit (°F)) under medium and high emission scenarios and 1 to 1.5 °C (1.8 to 2.7 °F) under a low emissions scenario (Magrin *et al.* 2014, p. 1502; Carabine and Lemma 2014, p. 10). Projected changes in rainfall in South America vary by region. Reductions are estimated for northeast Brazil and the Amazon (Magrin *et al.* 2014, p. 1502; Carabine and Lemma 2014, pp. 10–11). At a national level, climate change may induce significant reductions in forestland in all Brazilian regions (Féres *et al.* 2009, pp. 12, 15).

Temperature increases in Brazil are expected to be greatest over the Amazon rainforest, where Pará is located, with models indicating a strong warming and drying of this region during the 21st century, particularly after 2040 (Marengo *et al.* 2011, pp. 8, 15, 27, 39, 48; Féres *et al.* 2009, p. 2). Estimates of temperature changes in Amazonia are 2.2 °C (4 °F) under a low greenhouse gas emission scenario and 4.5 °C (8 °F) under a high-emission scenario by the end of the 21st century (2090–2099) (Marengo *et al.* 2011, p. 27). Several models indicate Amazonia is at a high risk of forest loss and more frequent wildfires (Magrin *et al.* 2007, p. 596). Some leading global circulation models suggest extreme weather events, such as droughts, will

increase in frequency or severity due to global warming. As a result, droughts in Amazonian forests could become more severe in the future (Marengo *et al.* 2011, p. 48; Laurance *et al.* 2001, p. 782). For example, the 2005 drought in Amazonia was a 1-in-20-year event; however, those conditions may become a 1-in-2-year event by 2025, and a 9-in-10-year event by 2060 (Marengo *et al.* 2011, p. 28). Impacts of deforestation are greater under drought conditions as fires set for forest clearances burn larger areas (Marengo *et al.* 2011, p. 16). Additionally, drought increases the vulnerability of seasonal forests of the Amazon, such as those found in eastern Amazonia, to wildfires during droughts (Laurance *et al.* 2001, p. 782).

Previous work has indicated that, under increasing temperature and decreasing rainfall conditions, the rainforest of the Amazon could be replaced with different vegetation. Some models have predicted a change from forests to savanna-type vegetation over parts of, or perhaps the entire, Amazon in the next several decades (Magrin *et al.* 2014, p. 1523; Marengo *et al.* 2011, pp. 11, 18, 29, 43; Magrin *et al.* 2007, pp. 583, 596). In the regions where the hyacinth macaw occurs, the climate features a dry season, which prevents the growth of an extensive closed-canopy tropical forest. Therefore, the transition of the Amazon rainforests could provide additional suitable habitat for the hyacinth macaw. However, we do not know how the specific food and nesting resources the hyacinth macaw uses will be impacted if there is an increase in the dry season. Furthermore, there are uncertainties in this modeling, and the projections are not definitive outcomes. In fact, some models indicate that conditions are likely to get wetter in Amazonia in the future (Marengo *et al.* 2011, pp. 28–29). These uncertainties make it challenging to predict the likely effects of continued climate change on the hyacinth macaw.

Temperatures in the Cerrado, which covers the Gerais region, are also predicted to increase; the maximum temperature in the hottest month may increase by 4 °C (7.2 °F) and by

2100 may increase to approximately 40 °C (104 °F) (Marini *et al.* 2009, p. 1563). Along with changes in temperature, other models have predicted a decrease in tree diversity and range sizes for birds in the Cerrado.

Projections based on a 30-year average (2040–2069) indicate serious effects to Cerrado tree diversity in coming decades (Marini *et al.* 2009, p. 1559; Siqueira and Peterson 2003, p. 4). In a study of 162 broad-range tree species, the potential distributional area of most trees was projected to decline by more than 50 percent. Using two climate change scenarios, 18–56 species were predicted to go extinct in the Cerrado, while 91–123 species were predicted to decline by more than 90 percent in the potential distributional area (Siqueira and Peterson 2003, p. 4).

Of the potential impacts of predicted climate-driven changes on bird distribution, extreme temperatures seemed to be the most important factor limiting distribution, revealing their physiological tolerances (Marini *et al.* 2009, p. 1563). In a study on changes in range sizes for 26 broad-range birds in the Cerrado, range sizes are expected to decrease over time, and significantly so as soon as 2030 (Marini *et al.* 2009, p. 1564). Changes ranged from a 5-percent increase to an 80-percent decrease under two dispersal scenarios for 2011–2030, 2046–2065, and 2080–2099 (Marini *et al.* 2009, p. 1561). The largest potential loss in range size is predicted to occur among grassland and forest-dependent species in all timeframes (Marini *et al.* 2009, p. 1564). These species will likely have the most dire future conservation scenarios because these habitat types are the least common (Marini *et al.* 2009, p. 1559). Although this study focused on broad-range bird species, geographically restricted birds, such as hyacinth macaw, are predicted to become rarer (Marini *et al.* 2009, p. 1564).

Whether species will or will not adapt to new conditions is difficult to predict; synergistic effects of climate change and habitat fragmentation, or other factors, such as biotic interactions,

may hasten the need for conservation even more (Marini *et al.* 2009, p. 1565). Although there are uncertainties in the climate-change modeling discussed above, the overall trajectory is one of increased warming under all scenarios. Species like the hyacinth macaw, whose habitat is limited, population is reduced, are large in physical size, and are highly specialized are more vulnerable to climatic variations and at a greater risk of extinction (Guedes 2009, p. 44).

We do not know how the habitat of the hyacinth macaw may change under these conditions, but we can assume some change will occur. The hyacinth macaw is experiencing habitat loss due to widespread expansion of agriculture and cattle ranching. Climate change has the potential to further decrease the specialized habitat needed by the hyacinth macaw; the ability of the hyacinth macaw to cope with landscape changes due to climate change is questionable given the specialized needs of the species. Furthermore, one of the factors that affected reproductive rates of hyacinth macaws in the Pantanal was variations in temperature and rainfall (Guedes 2009, p. 42). Hotter, drier years, as predicted under different climate change scenarios, could result in greater impacts to hyacinth macaw reproduction due to impacts on palm fruit and thereby foraging success, and could increase competition with other bird and mammal species for limited resources.

#### Low Reproductive Rates and Competition

The specialized nature and reproductive biology of the hyacinth macaw contribute to low recruitment of juveniles and decrease the ability to recover from reductions in population size caused by anthropogenic disturbances (Faria *et al.* 2008, p. 766; Wright *et al.* 2001, p. 711). This species' vulnerability to extinction is further heightened by deforestation that negatively affects the availability of essential food and nesting resources. In addition to direct impacts on food and nesting resources and hyacinth macaws themselves, several other factors affect the reproductive

success of the hyacinth macaw. In the Pantanal, competition, predation, disease, destruction or flooding of nests, and climatic conditions and variations are factors affecting reproductive success of the hyacinth macaw (Guedes 2009, pp. 5, 8, 42; Guedes 2004b, p. 7).

In the Pantanal, competition for nesting sites is intense. The hyacinth macaw nests almost exclusively in manduvi trees; however, 17 other bird species, small mammals, and honey bees (*Apis mellifera*) also use manduvi cavities (Guedes and Vicente 2012, pp. 148, 157; Guedes 2009, p. 60; Pizo *et al* 2008, p. 792; Pinho and Nogueira 2003, p. 36). Bees are even known to occupy artificial nests that could be used by hyacinth macaws (Pinho and Nogueira 2003, p. 33; Snyder *et al.* 2000, p. 120). Manduvi is a key species for the hyacinth macaw; these cavities are already limited and there is evidence of decreased recruitment of this species of tree (Santos Jr. *et al.* 2006, p. 181). Competition for nesting cavities is exacerbated because manduvi trees must be at least 60 years old, and on average 80 years old, to produce cavities large enough to be used by the hyacinth macaw (Guedes 2009, pp. 59–60; Pizo *et al.* 2008, p. 792; Santos Jr. *et al.* 2006, p. 185). Given that there is currently a limited number of manduvi trees in the Pantanal of adequate size capable of accommodating the hyacinth macaw, evidence of reduced recruitment of these sized manduvi, and numerous species that also use this tree, competition will certainly increase as the number of manduvi decreases, further affecting reproduction by limiting tree cavities available to the hyacinth macaw for nesting (Guedes 2009, p. 60). Furthermore, a shortage of suitable nesting sites could lead to increased competition resulting in an increase in infanticide and egg destruction by other hyacinth macaws and other macaw species (Lee 2010, p. 2). Black vultures (*Coragyps atratus*), collared forest falcons, and red-and-green macaws (*Ara chloropterus*) break hyacinth macaw eggs when seeking nesting cavities (Guedes 2009, p. 75).

A 10-year study conducted in the Miranda region of the Pantanal concluded that the majority of hyacinth macaw nests (63 percent) failed, either partially or totally, during the egg phase. While predation accounted for 52 percent of lost eggs during incubation (see Factor C discussion, above), the remaining eggs lost during the 10-year study of the Miranda region did not hatch due to infertility, complications during embryo development, inexperience of young couples that accidentally smash their own eggs while entering and exiting the nest, breaking by other bird and mammal species wanting to occupy the nesting cavity, and broken trees and flooding of nests (Guedes 2009, p. 75). Of the 320 nests that saw eggs hatch and chicks born, 49 percent experienced a total or partial loss of chicks (Guedes 2009, pp. 68). From the chicks that were born, on average 37 percent (n=183) failed before leaving the nest because of mortality or predation (Guedes 2009, pp. 66, 78). Of these chicks that did not survive, 62 percent (n=114) were lost due to starvation, low temperature, disease or infestation by ectoparasites, flooding of nests, and breaking of branches; the other 38 percent (n=69) were lost to predation (Guedes 2009, pp. 79).

Variations in temperature and rainfall may also affect reproduction of the hyacinth macaw in the Pantanal (Guedes 2009, p. 42). Years with higher temperatures and lower rainfall experience decreased production of fruits and foraging, leading to a decrease in reproduction of hyacinth macaws the following year (Guedes 2009, pp. 42–44). This decrease is especially problematic for a species that relies on only two species of palm nuts as a source of food. Competition with other bird and mammal species may also increase during low food years. Acuri are available year round, even during times of fruit scarcity, making it a resource many other species also depend on during unfavorable periods (Guedes 2009, p. 44). Additionally, the El Niño event during the 1997–98 breeding season caused hotter, wetter conditions favoring

breeding pairs, but survival of the chicks was reduced. In 1999, a longer breeding period was observed following drier, colder conditions caused by the La Niña that same year; however, 54 percent of the eggs were lost that year (Guedes 2009, p. 43).

### *Conservation Measures*

A network of nongovernmental organizations, Rede Cerrado, has been established to promote local sustainable-use practices for natural resources (Klink and Machado 2005, p. 710). Rede Cerrado provided the Brazilian Ministry of the Environment recommendations for urgent actions for the conservation of the Cerrado. As a result, a conservation program was established to integrate actions for conservation in regions where agropastoral activities, which is agriculture practice of growing crops and raising livestock, were especially intense and damaging (Klink and Machado 2005, p. 710). Conservation International, The Nature Conservancy, and World Wildlife Fund have worked to promote alternative economic activities, such as ecotourism, sustainable use of fauna and flora, and medicinal plants, to support the livelihoods of local communities (Klink and Machado 2005, p. 710). Although these programs demonstrate awareness of the need for protection and efforts in protecting the Cerrado, we have no details on the specific work or accomplishments of these programs, or how they would affect, or have affected, the hyacinth macaw and its habitat.

In 1990, the Hyacinth Macaw Project (Projecto Arara Azul) began with support from the University for the Development of the State (Mato Grosso do Sul) and the Pantanal Region (Brouwer 2004, unpaginated; Guedes 2004b, p. 28; Pittman 1999, p. 39). This program works with local landowners, communities, and tourists to monitor the hyacinth macaw, study the biology of this species, manage the population, and promote its conservation and ensure its protection in the Pantanal (Santos Jr. 2008, p. 135; Harris *et al.* 2005, p. 719; Brouwer 2004,



unpaginated; Guedes 2004a, p. 281). Studies have addressed feeding, reproduction, competition, habitat survival, chick mortality, behavior, nests, predation, movement, and threats contributing to the reduction in the wild population (Guedes 2009, p. xiii; Guedes 2004a, p. 281). Because there are not enough natural nesting sites in this region, the Hyacinth Macaw Project began installing artificial nest boxes; more than 180 have been installed. Hyacinth macaws have adapted to using the artificial nests, leading to more reproducing couples and successful fledging of chicks. Species that would otherwise compete with hyacinth macaws for nesting sites have also benefitted from the artificial nests as a result of reduced competition for natural nesting sites. Hyacinth macaws reuse the same nest for many years; eventually the nests start to decay or become unviable. The Hyacinth Macaw Project also repairs these nests (natural and artificial) so they are not lost. In areas where suitable cavities are scarce, the loss of even one nest could have substantial impacts on the population. Additionally, wood boards are used to make cavity openings too small for predators, while still allowing hyacinth macaws to enter (Brouwer 2004, unpaginated; Guedes 2004a, p. 281; Guedes 2004b, p. 8).

In nests with a history of unsuccessful breeding, the Hyacinth Macaw Project has also implemented chick management, with the approval of the Committee for Hyacinth Macaw Conservation coordinated by IBAMA. Hyacinth macaw eggs are replaced with chicken eggs, and the hyacinth eggs are incubated in a field laboratory. After hatching, chicks are fed for a few days, and then reintroduced to the original nest or to another nest with a chick of the same age. This process began to increase the number of chicks that survived and fledged each year (Brouwer 2004, unpaginated; Guedes 2004a, p. 281; Guedes 2004b, p. 9).

Awareness has also been raised with local cattle ranchers. Attitudes have begun to shift, and ranchers are proud of having macaw nests on the property. Local inhabitants also served as

project collaborators (Guedes 2004a, p. 282; Guedes 2004b, p. 10). This shift in attitude has also diminished the threat of illegal trade in the Hyacinth Macaw Project area (Brouwer 2004, unpaginated).

The Hyacinth Macaw Project has contributed to the increase of the hyacinth population in the Pantanal since the 1990s (Harris *et al.* 2005, p. 719). Nest and chick management implemented by the Hyacinth Macaw Project has led to an increase in the Pantanal population; for every 100 couples that reproduce, 4 juveniles survive and are added to the population. Additionally, hyacinth macaws have expanded to areas where the species previously disappeared, as well as new areas (Guedes 2012, p. 1; Guedes 2009, pp. 4–5, 8, 35–36, 39, 82).

Nest boxes can have a marked effect on breeding numbers of many species on a local scale (Newton 1994, p. 274), and having local cattle ranchers appreciate the presence of the hyacinth macaw on their land helps diminish the effects of habitat destruction and illegal trade. However, the Hyacinth Macaw Project area does not encompass the entire Pantanal region. Active management has contributed to the increase in the hyacinth population, and farmers have begun to protect hyacinth macaws on their property, but land conversion for cattle ranching continues to occur in the Pantanal. If cattle grazing and trampling of manduvi saplings, as well as the burning of pastures for maintenance continues, the hyacinth's preferred natural cavities will be severely limited and the species will completely rely on the installation of artificial nest boxes, which is currently limited to the Hyacinth Macaw Project area. Furthermore, survival of hyacinth macaw eggs and chicks are being impacted by predation, competition, climate variations, and other natural factors. Even with the assistance of the Hyacinth Macaw Project, only 35 percent of eggs survive to the juvenile stage.

## **Finding**

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in part 424 of title 50 of the Code of Federal Regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. As required by the Act, we conducted a review of the status of the species and considered the five factors in assessing whether the hyacinth macaw is in danger of extinction throughout all or a significant portion of its range (endangered) or likely to become endangered within the foreseeable future throughout all or a significant portion of its range (threatened). We examined the best scientific and commercial information available regarding factors affecting the status of the hyacinth macaw. We reviewed the petition, information available in our files, information provided by peer review and public comments, and other available published and unpublished information.

In considering what factors may constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to the factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine if it may drive or contribute to the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as those terms are defined by the Act.

Across its range, the hyacinth macaw is losing habitat, including those essential food and nesting resources, to expanding agriculture and cattle ranching. Pará has long been the epicenter of illegal deforestation primarily caused by cattle ranching. Large-scale forest conversion for colonization and cattle ranching due to state subsidies, infrastructure development, favorable climate in Pará, lower prices for land, and expansion of soy cultivation in other areas has led to

displacement of pastures into parts of Pará. Although deforestation rates decreased between 2005 and 2012, Amazon deforestation rates increased in 2013, 2015, and 2016 (see Table 1, above).

In the Gerais region, more than 50 percent of the original Cerrado vegetation has been lost due to conversion to agriculture and pasture. Although annual deforestation rates have decreased, the amount of remaining hyacinth macaw habitat continues its slow and steady decrease. Remaining Cerrado vegetation continues to be lost to conversion for soy plantations and extensive cattle ranching. Projections for coming decades show the largest increase in agricultural production occurring in the Cerrado.

The greatest cause of habitat loss in the Pantanal is the expansion of cattle ranching. Only 6 percent of the Pantanal landscape is cordilleras, higher areas where the manduvi occur. These upland forests, including potential nesting trees, are often removed and converted to pastures for grazing during the flooding season; however, palm species used by hyacinth macaws for food are usually left because cattle also feed on the palm nuts. Fire is a common method for renewing pastures, controlling weeds, and controlling pests in the Pantanal, although uncontrolled fires are known to impact patches of manduvi. Fires can help in the formation of cavities, but too frequent fires can prevent trees from surviving to a size capable of providing suitable cavities and can cause a high rate of tree loss. Five percent of manduvi trees are lost each year due to deforestation, fires, and storms.

In addition to the direct removal of trees and the impact of fire on forest establishment, cattle impact forest recruitment. Intense livestock activity can affect seedling recruitment via trampling and grazing. Cattle also compact the soil such that regeneration of forest species is severely reduced. This type of repeated disturbance can lead to an ecosystem dominated by invasive trees, grasses, bamboo, and ferns. Manduvi, which contain the majority of hyacinth

macaw nests, are already limited in the Pantanal; only 5 percent of the existing adult manduvi trees in south-central Pantanal and 11 percent in the southern Pantanal contain suitable cavities for hyacinth macaws. Evidence of severely reduced recruitment of manduvi trees suggests that this species of tree, of adequate size to accommodate the hyacinth macaw, is not only scarce now but likely to become increasingly scarce in the future.

Deforestation for agriculture and cattle ranching, cattle trampling and foraging, and burning of forest habitat result in the loss of mature trees with natural cavities of sufficient size and a reduction in recruitment of native species that could eventually provide nesting cavities. A shortage of nest sites can jeopardize the persistence of the hyacinth macaw by constraining breeding density, resulting in lower recruitment and a gradual reduction in population size. This situation may lead to long-term effects on the viability of the hyacinth macaw population, especially in Pará and the Pantanal where persistence of nesting trees is compromised. While the Hyacinth Macaw Project provides artificial nest alternatives, such nests are only found within the project area.

Loss of essential tree species also negatively impacts the hyacinth macaw by increasing competition for what is already a shortage of suitable nest sites. In the Pantanal, the hyacinth macaw nests almost exclusively in manduvi trees. The number of manduvi large enough to provide suitable cavities is already limited. Additionally, 17 other bird species, small mammals, and honey bees also use manduvi cavities. Competition has been so fierce that hyacinth macaws were unable to reproduce, and it resulted in an increase in egg destruction and infanticide. As the number of suitable trees is further limited, competition for adequate cavities to accommodate the hyacinth macaw will certainly increase, reducing the potential for hyacinth macaws to reproduce. In the Gerais region, hyacinth macaws mostly nest in rock crevices, most likely a response to the

destruction of nesting trees; we do not know if the hyacinth macaws in the Pantanal will respond in the same way to the loss of nesting trees. Although it is possible that hyacinth macaws could use alternative nesting trees in Pará and the Pantanal, deforestation in these regions would impact alternative nesting trees, as well as food sources, resulting in the same negative effect on the hyacinth macaw. Furthermore, competition for limited nesting and food resources would continue.

Deforestation also reduces the availability of food resources. The species' specialized diet makes it vulnerable to changes in food availability. Another *Anodorhynchus* species, the Lear's macaw, is critically endangered due, in part, to the loss of its specialized food source (licuri palm stands). Inadequate nutrition can contribute to poor health and is known to have reduced reproduction in hyacinth macaws. In Pará and the Gerais region, where food sources are being removed, persistence of the species is a concern.

In addition to direct impacts on food and nesting resources and hyacinth macaws themselves, several other factors affect the reproductive success of the hyacinth macaw. Information indicates that hyacinth macaws in Pará and Gerais are hunted as a source of protein and for feathers to be used in local handicrafts. Although we do not have information on the numbers of macaws taken for these purposes, given the small populations in these two regions, any loss of potentially reproducing individuals could have a devastating effect on the ability of those populations to increase. Additionally, in the Pantanal, predation, variations in temperature and rainfall, and ectoparasites all contribute to loss of eggs and chicks, directly affecting the reproductive rate of hyacinth macaws.

Brazil has various laws to protect its natural resources. Despite these laws and plans to significantly reduce deforestation, expanding agriculture and cattle ranching has contributed to

increases in deforestation rates in some years, and the total deforested area continues to increase each year. However, Brazil has obtained significant reduction of the deforestation rate after 12 years of the PPCDAm and 6 years of PPCerrado, with most of the reduction occurring within the Amazon basin. Additionally, hunting continues in some parts of the hyacinth macaw's range despite laws prohibiting this activity. Without effective implementation and enforcement of environmental laws, deforestation and hunting will continue to the detriment of hyacinth macaws.

Climate change models have predicted increasing temperatures and decreasing rainfall throughout most of Brazil. There are uncertainties in this modeling, and the projections are not definitive outcomes. How a species may adapt to changing conditions is difficult to predict. We do not know how the habitat of the hyacinth macaw may vary under these conditions, but we can assume some change will occur. The hyacinth macaw is experiencing habitat loss due to widespread expansion of agriculture and cattle ranching. Effects of climate change have the potential to further decrease the specialized habitat needed by the hyacinth macaw; the ability of the hyacinth macaw to cope with landscape changes due to climate change is questionable given the specialized needs of the species. Furthermore, hotter, drier years, as predicted under different climate change scenarios, could result in greater impacts to hyacinth macaw reproduction due to impacts on palm fruit and thereby foraging success, and could increase competition with other bird and mammal species for limited resources.

Based on the long-term trends of continued loss of habitat and associated loss of essential resources (nest sites and food sources) throughout the hyacinth macaws range, declines in the species remaining habitat and in its population are expected to continue into the foreseeable future. Pará is one of the states where most of Brazil's agriculture expansion is taking place.

Modeled future deforestation is concentrated in this area. The Cerrado is the most desirable biome for agribusiness expansion and contains approximately 40 million ha (99 million ac) of “environmental surplus” that could be legally deforested; therefore, this region will likely continue to suffer deforestation. Ninety-five percent of the Pantanal is privately owned, 80 percent of which is used for cattle ranches. Clearing land to establish pasture is perceived as the economically optimal land use, while land not producing beef is often perceived as unproductive. Continued loss of remaining habitat will lead to long-term effects on the viability of the hyacinth macaw. Additionally, any factors that contribute to the loss of eggs and chicks ultimately reduce reproduction and recruitment of juveniles into the population and the ability of those populations to recover. Therefore, long-term survival of this species is a concern.

In total, there are approximately 6,500 hyacinth macaws left in the wild, dispersed among three populations. Two of the populations, Pará and Gerais, contain 1,000–1,500 individuals combined; the Pantanal population contains 5,000 individuals. The current overall population trend for the hyacinth macaw is reported as decreasing, although there are no reports of extreme fluctuations in the number of individuals. The hyacinth macaw population has grown in the Pantanal; however, the growth is not sufficient to counter the continued and predicted future anthropogenic disturbances. Hyacinth macaws have a naturally low reproductive rate; not all hyacinth macaw chicks fledge; and due to the long period of chick dependence, hyacinth macaws breed only every 2 years. In the Pantanal population, which is the largest population of hyacinth macaws, only 15–30 percent of adults attempt to breed each year; it may be that as small or an even smaller percentage in Pará and Gerais attempt to breed. This relatively low recruitment of juveniles decreases the ability of a population to recover from reductions caused by anthropogenic disturbances. Thus, hyacinth macaws may not have a high enough reproduction



rate and may not survive in areas where nest sites and food sources are destroyed. Because the hyacinth macaw has specialized food and nest site needs, it is at higher risk of extinction from the anthropogenic stressors described above.

Section 3 of the Act defines an “endangered species” as “any species which is in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” After analyzing the species’ status in light of the five factors discussed above, we find the hyacinth macaw is a “threatened species” as a result of the following: Continued deforestation and reduced recruitment of forests (Factor A), hunting (Factor B), predation and disease (Factor C), low reproduction rate and competition (Factor E), and effects of climate change (Factor E). Furthermore, despite regulatory mechanisms to protect the hyacinth macaw and the forests it depends on, deforestation and hunting for sustenance continues.

In our 2012 proposed rule (77 FR 39965; July 6, 2012), we found that the hyacinth macaw was in danger of extinction (an endangered species) based on estimates indicating the original vegetation of the Amazon, Cerrado, and Pantanal, including the hyacinth macaw’s habitat, would be lost between the years 2030 and 2050 due to deforestation, combined with its naturally low reproductive rate, highly specialized nature, hunting, competition, and effects of climate change. While deforestation rates between 2002 and 2014 indicate a decrease in the annual deforestation rate, and there has been a decrease in deforestation compared to historical rates, there continues to be a slow and steady increase in the total area deforested. Deforestation rates in Pará decreased by 20 percent between 2013 and 2014, increased by 14 percent in 2015, and increased by 41 percent in 2016. However, the PPCDAm has reduced the deforestation rate

by approximately 80 percent in relation to the 2004 rate in the Legal Amazon. Recent estimates of deforestation indicate annual deforestation rates in the Cerrado and Pantanal have decreased by approximately 40 and 37 percent, respectively, although within two states in the Cerrado, Tocantins and Maranhão, deforestation increased in 2016 by 40 and 25 percent, respectively. We recognize that deforestation rates may fluctuate annually, with some years having a higher rate than other years. However, because the annual rate of deforestation is decreasing over the long term, the loss of all native habitat from these areas, including the species of trees needed by the hyacinth macaw for food and nesting, is not as immediate as initially predicted. Therefore, even with the additional habitat loss that is imminent, we do not find that the hyacinth macaw is currently in danger of extinction.

The hyacinth macaw remains a species particularly vulnerable to extinction due to the interaction between continued habitat loss within the foreseeable future and its highly specialized needs for food and nest trees. The term “foreseeable future” describes the extent to which we can reasonably rely on the predictions about the future in making determinations about the future conservation status of the species. Based on the best available scientific studies and information assessing land-use trends, lack of enforcement of laws, predicted landscape changes under climate-change scenarios, the persistence of essential food and nesting resources, and predictions about how those threats may impact the hyacinth macaw or similar species, we conclude that the species is likely to be in danger of extinction in the foreseeable future throughout all of its range. On the basis of the best scientific and commercial information, we find that the hyacinth macaw meets the definition of a “threatened species” under the Act, and we are listing the hyacinth macaw as threatened throughout its range.

### **Significant Portion of its Range**

Under the Act and our implementing regulations, a species warrants listing if it is endangered or threatened. The Act defines “endangered species” as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and “threatened species” as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). Because we have determined that the hyacinth macaw is threatened throughout all of its range, under the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species and “Threatened Species” (79 FR 37578; July 1, 2014) (SPR Policy), if a species warrants listing throughout all of its range, no portion of the species’ range can be a “significant” portion of its range. The SPR policy is applied to all status determinations, including analyses for the purposes of making listing, delisting, and reclassification determinations. The procedure for analyzing whether any portion is an SPR is similar, regardless of the type of status determination we are making.

While under the SPR Policy no further analysis of “significant portion of its range” in this circumstance is required, we recognize that the SPR Policy is currently under judicial review, so we also took the additional step of considering whether there could be any significant portions of the species’ range where the species is in danger of extinction. We evaluated whether there is substantial information indicating that there are any portions of the species’ range: (1) That may be “significant,” and (2) where the species may be in danger of extinction. In practice, a key part of identifying portions appropriate for further analysis is whether the threats are geographically concentrated. For the hyacinth macaw, the primary driver of its status is habitat destruction. This threat is affecting the species throughout its entire range and is of similar magnitude throughout its range; therefore, there is not a meaningful geographical concentration

of threats to the hyacinth macaw. As a result, even if we were to undertake a detailed SPR analysis, there would not be any portions of the species' range where the threats are harming the species to a greater degree such that it is in danger of extinction in that portion.

#### **4(d) Rule**

When a species is listed as endangered, certain actions are prohibited under section 9 of the Act and our regulations at 50 CFR 17.21. These include, among others, prohibitions on take within the United States, within the territorial seas of the United States, or upon the high seas; import; export; and shipment in interstate or foreign commerce in the course of a commercial activity. Exceptions to the prohibitions for endangered species may be granted in accordance with section 10 of the Act and our regulations at 50 CFR 17.22.

The Act does not specify particular prohibitions and exceptions to those prohibitions for threatened species. Instead, under section 4(d) of the Act, the Secretary, as well as the Secretary of Commerce depending on the species, was given the discretion to issue such regulations as deemed necessary and advisable to provide for the conservation of such species. The Secretary also has the discretion to prohibit by regulation with respect to any threatened species any act prohibited under section 9(a)(1) of the Act. For the hyacinth macaw, the Service is exercising our discretion to issue a 4(d) rule. By adopting the 4(d) rule, we are incorporating all prohibitions and provisions of 50 CFR 17.31 and 17.32, except that import and export of certain hyacinth macaws into and from the United States and certain acts in interstate commerce are allowed without a permit under the Act, as explained below.

#### *Import and Export*

The 4(d) rule imposes a prohibition on imports and exports (by incorporating 50 CFR 17.31), but creates exceptions for certain hyacinth macaws. The 4(d) rule largely adopts the

existing conservation regulatory requirements of CITES and the WBCA as the appropriate regulatory provisions for the import and export of certain hyacinth macaws. The import and export of birds into and from the United States, taken from the wild after the date this species is listed under the Act; conducting an activity that could take or incidentally take hyacinth macaws; and foreign commerce must meet the requirements of 50 CFR 17.31 and 17.32, including obtaining a permit under the Act. However, the 4(d) rule allows a person to import or export without a permit issued under the Act if the specimen either: (1) was held in captivity prior to the date this species is listed under the Act; or (2) is a captive-bred specimen, provided the export under either of these scenarios is authorized under CITES and the import is authorized under CITES and the WBCA. If a specimen was taken from the wild and held in captivity prior to the date this species is listed under the Act, the importer or exporter must provide documentation to support that status, such as a copy of the original CITES permit indicating when the bird was removed from the wild or museum specimen reports. For captive-bred birds, the importer must provide either a valid CITES export/re-export document issued by a foreign Management Authority that indicates that the specimen was captive bred by using a source code on the face of the permit of either “C,” “D,” or “F.” Exporters of captive-bred birds must provide a signed and dated statement from the breeder of the bird confirming its captive-bred status, and documentation on the source of the breeder’s breeding stock. The source codes of C, D, and F for CITES permits and certificates are as follows:

(C) Animals bred in captivity in accordance with Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 5 of the Convention.

(D) Appendix-I animals bred in captivity for commercial purposes in operations included in the Secretariat's Register, in accordance with Resolution Conf. 12.10 (Rev. CoP15), and Appendix-I plants artificially propagated for commercial purposes, as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 4, of the Convention.

(F) Animals born in captivity (F1 or subsequent generations) that do not fulfill the definition of “bred in captivity” in Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof.

The 4(d) rule’s provisions regarding captive-bred birds apply to birds bred in the United States and abroad. The terms “captive-bred” and “captivity” used in the 4(d) rule are defined in the regulations at 50 CFR 17.3 and refer to wildlife produced in a controlled environment that is intensively manipulated by man from parents that mated or otherwise transferred gametes in captivity. Although the 4(d) rule requires a permit under the Act to “take” (including harm and harass) a hyacinth macaw, our regulations at 50 CFR 17.3 establish that “take,” when applied to captive wildlife, does not include generally accepted animal husbandry practices, breeding procedures, or provisions of veterinary care for confining, tranquilizing, or anesthetizing, when such practices are not likely to result in injury to the wildlife.

We assessed the conservation needs of the hyacinth macaw in light of the broad protections provided to the species under CITES and the WBCA. The hyacinth macaw is listed in Appendix I under CITES, a treaty which contributes to the conservation of the species by monitoring international trade and ensuring that trade in Appendix I species is not detrimental to the survival of the species (see *Conservation Status*, above). The purpose of the WBCA is to promote the conservation of exotic birds and to ensure that imports of exotic birds into the United States do not harm them (see Factor D discussion, above). The best available commercial

data indicate that legal and illegal trade of hyacinth macaws is not currently occurring at levels that are affecting the populations of the hyacinth macaw in its three regions. Accordingly, we find that the import and export requirements of the 4(d) rule provide the necessary and advisable conservation measures that are needed for this species. This 4(d) rule streamlines the permitting process by deferring to existing laws that are protective of hyacinth macaws in the course of import and export and not requiring permits under the Act for certain types of activities.

#### *Interstate Commerce*

Under the 4(d) rule, a person may deliver, receive, carry, transport, or ship a hyacinth macaw in interstate commerce in the course of a commercial activity, or sell or offer to sell in interstate commerce a hyacinth macaw without a permit under the Act. At the same time, the prohibitions on take under 50 CFR 17.21 as extended to threatened species under 50 CFR 17.31 will apply under this 4(d) rule, and any interstate commerce activities that could incidentally take hyacinth macaws or otherwise prohibited acts in foreign commerce will require a permit under 50 CFR 17.32.

Persons in the United States have imported and exported captive-bred hyacinth macaws for commercial purposes and for scientific purposes, but trade has been very limited (UNEP–WCMC 2011, unpaginated). We have no information to suggest that interstate commerce activities are associated with threats to the hyacinth macaw or would negatively affect any efforts aimed at the recovery of wild populations of the species; therefore, we are not placing into effect any prohibitions on interstate commerce of hyacinth macaw within the United States. Because the species is otherwise protected in the course of interstate commercial activities under the take provisions and foreign commerce provisions contained in 50 CFR 17.31, and international trade

of this species is regulated under CITES, we find that this 4(d) rule contains all the prohibitions and authorizations necessary and advisable for the conservation of the hyacinth macaw.

### **Required Determinations**

*National Environmental Policy Act (42 U.S.C. 4321 et seq.)*

We have determined that we do not need to prepare an environmental assessment, as defined under the authority of the National Environmental Policy Act of 1969, in connection with regulations adopted under Section 4(a) of the Endangered Species Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

### **References Cited**

A list of all references cited in this document is available at <http://www.regulations.gov>, Docket No. FWS–R9–ES–2012–0013, or upon request from the U.S. Fish and Wildlife Service, Ecological Services, Branch of Foreign Species (see **FOR FURTHER INFORMATION CONTACT**).

### **Authors**

The primary authors of this document are staff members of the Branch of Foreign Species, Ecological Services Program, U.S. Fish and Wildlife Service.

### **List of Subjects in 50 CFR Part 17**

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

### **Regulation Promulgation**

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:



## PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

**Authority:** 16 U.S.C. 1361–1407; 1531–1544; 4201–4245, unless otherwise noted.

2. Amend § 17.11(h) by adding an entry for “Macaw, hyacinth” in alphabetical order under BIRDS to the List of Endangered and Threatened Wildlife, to read as follows:

### §17.11 Endangered and threatened wildlife.

\* \* \* \* \*

(h) \* \* \*

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * *				
BIRDS				
* * * * *				
Macaw, hyacinth	<i>Anodorhynchus hyacinthinus</i>	Wherever found	T	83 FR [insert <i>Federal Register</i> page where the document begins], [Insert date of publication in the <i>Federal Register</i> ]; 50 CFR 17.41(c) <sup>4d</sup>
* * * * *				

3. Amend § 17.41 by revising paragraph (c) introductory text, paragraph (c)(1), and paragraph (c)(2)(ii) introductory text, and by adding paragraph (c)(2)(ii)(D) to read as follows:

### § 17.41 Special rules—birds.

\* \* \* \* \*

(c) The following species in the parrot family: Salmon-crested cockatoo (*Cacatua moluccensis*), yellow-billed parrot (*Amazona collaria*), white cockatoo (*Cacatua alba*), and hyacinth macaw (*Anodorhynchus hyacinthinus*).

(1) Except as noted in paragraphs (c)(2) and (c)(3) of this section, all prohibitions and provisions of §§ 17.31 and 17.32 of this part apply to these species.

(2) \* \* \*

(ii) *Specimens held in captivity prior to certain dates:* You must provide documentation to demonstrate that the specimen was held in captivity prior to the dates specified in paragraphs (c)(2)(ii)(A), (B), (C), or (D) of this section. Such documentation may include copies of receipts, accession or veterinary records, CITES documents, or wildlife declaration forms, which must be dated prior to the specified dates.

\* \* \* \* \*

(D) For *hyacinth macaws*: [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] (the date this species was listed under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.)).

\* \* \* \* \*

Dated: July 2, 2018\_\_\_\_\_

\_\_\_\_\_  
James W. Kurth  
Deputy Director,  
U.S. Fish and Wildlife Service,  
Exercising the Authority of the Director,  
U.S. Fish and Wildlife Service.

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